Liver Biopsy in the Japanese Quail and the Chicken

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Authors, in the process of determining the mode of genetic control of isozyme in poultry liver, consider it necessary to ascertain phenotypes of the bird prior to mating. Therefore we tried liver biopsy of poultry. Roncalli (1970) developed aspiration-technique of liver biopsy, using stainless steel canula and trocar. Authors established an easy and safety liver-biopsy-technique.

In this paper, liver-biopsy-technique developed by the authors is reported and at the same time the influence of liver biopsy on viability, egg production, copulation ability, growth and regeneration of liver were examined.

MATERIALS AND METHODS

Single comb White Leghorn chicken and Japanese quail, *Coturnix coturnix japonica* were used in this experiment. For the purpose of performing liver biopsy, the set of the instruments used for operation were as follows : a dissecting knife, a pair of dissecting scissors, a pincette and a dissecting table. For disinfection of skin and the instruments, 70% ethyl alcohol was used. To elucidate the influence of biopsy on physiological traits, egg production ratio, copulationability, growth-curve, and variation of body weight after biopsy were examined. Egg production data were recorded for a month prior to operation and for a month after operation.

PROCEDURE OF LIVER BIOPSY

1) *Fastening and picking*: Humerus parts of both wing and tibias of both feet were tied by hemp cord, respectively. The bird was stretched and fastened on the table on its right side. The fastened bird was picked from the seventh rib region to the thigh region (Fig. 1).

2) *Incision*: First, the skin was cut under the seventh rib about 2 cm in length in the quail, and 4cm in the chicken (Fig. 2). After the skin was cut, *Mm. abdominis* (*M. obliquus adbominis internus* and *M. rectus abdominis*) could be seen inside of the skin. Next, the *Mm. abdominis* was incised with a dissecting knife 2 cm in length in the quail and 4 cm in the chicken. *Mm. abdominis* was incised slowly and carefully during the incision, as it might injure some organs located inside of *Mm. abdominis*, if it is cut deeply at the muscle. Inside the *Mm. abdominis*, the *peritoneum* wrapping the internal organ could be seen. Liver, gizzard and other internal organs could be seen through the *peritoneum*. Next, this *peritoneum* was retended by a smal scissors or

a fine forceps.

3) *Location of liver*: After the *peritoneum* was torn, the gizzard could be seen clearly and the left lobe of liver anterior to the gizzard. In the egg laying female, white oviduct could be seen above the gizzard (Fig. 3). In the female, finding liver was easy. In the male, sometimes, liver was concealed with the *Mm. pectorials*. Accordingly, lobectomy of male is more difficult than that of female.

4) *Lobectomy and suture*: The edge of *M. pectorials* was pulled with the forceps. Next, the pulled edge of *M. pectorials* was cut with a small scissors. It is better to use a blunt edged forceps than a sharp edged one, because liver tissue is very fragle. Although it bleeds at lobectomy, bleeding ceases in a short time and blood clot was produced. Next, the blood clot was wiped out (Fig. 4). Finally, the *Mm. abdominis* and the skin were sutured and disinfected with the 70% ethyl alcohol. A lobectomized birds were reared in a clean cage (Fig. 5 and Fig. 6).

RESULT

1) *Weight of excision and viability*: In the quail and the chicken, age at lobectomy, weight of excision and viability after lobectomy are shown in Table 1. The age at which operation can be done was 28 days in the quail and 21 days in the chicken. Although the weight of excision of female in the immature stage is almost the same as that of male, the weight of excision of the female in the mature tends to be larger than that of the male.

Table 1. Age at lobectomy, weight of excision and viability of lobectomized birds in the liver biopsy of the Japanese quail and the chicken.

Bird	Age at lobectomy*	Sex	No. of birds	Weight of excision (mg)	Viability (%)
Japanese quail	28	Male	10	103± 12	90(90)
		Female	10	110± 9	80(90)
	70	Male	10	80± 14	90(100)
		Female	10	131± 18	100(100)
Chicken**	21	Male	10	140± 39	100(100)
		Female	10	138± 41	100(100)
	224	Male	1	1045±318	100(100)
		Female	1	1260±218	100(100)

( ) : Viability of control
* Age in days
** White Leghorn

Although, the viability after the biopsy in the Japanese quail was 10% inferior to the control in 28-day-old female and 70-day-old male, these differences are of no significance. In the chicken, there were no effects on the viability after the biopsy, either.

2) *Influence of biopsy on body weight*: Growth curves of the Japanese quail and the chicken, lobectomized at immature stage, are shown in the Figs. 8 and 9. In the quail, while the body

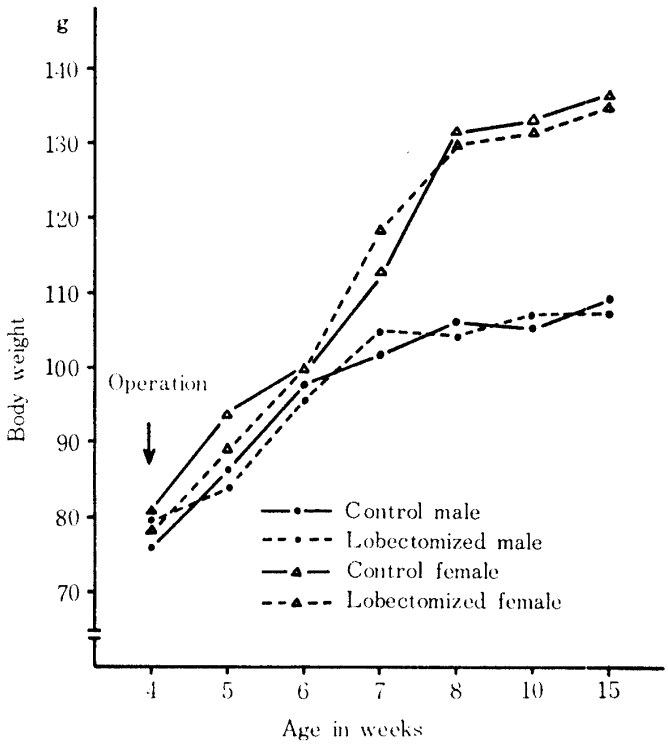


Fig. 8. Growth-curves in the Japanese quail lobectomized at 4 weeks of age.

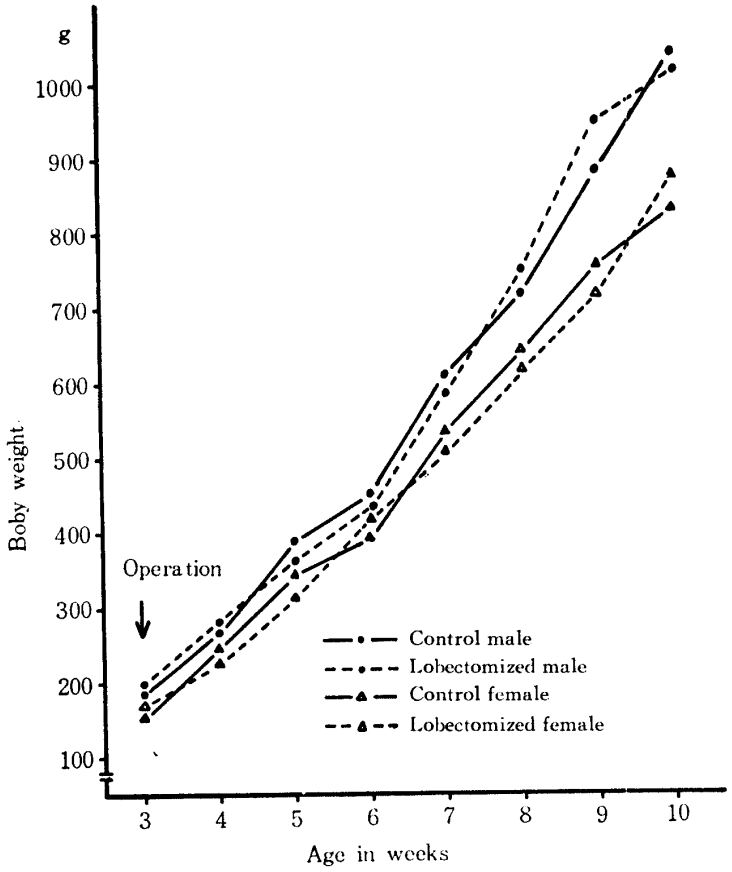


Fig. 9. Growth-curve in the chicken lobectomized at 3 weeks of age.

weight was lower than the control at 5 weeks of age and higher than the control at 7 weeks of age, these differences were not significant. At other weeks of age, body weights of the control and the lobectomized birds were not so different (Fig. 8). In the chicken, there was no difference on body weights between control and lobectomized birds either (Fig. 9).

Changes of body weight during a week after lobectomy at mature stage are shown in Table 2. In the Japanese quail, although body weights tended to decrease slightly in both sexes, there were no statisticaly significant differences. In case of the chicken, there was no difference, either. From these data, no influence of lobectomy on body weight was recognized.

Table 2. Body weight after lobectomy in the liver biopsy of the adult Japanese quail and the adult chicken.

	Quail*		Chicken**	
	Male 10***	Female 10	Male 4	Female 4
0 day after	109.1±4.1g	127.6±3.7g	3.31±0.20Kg	2.37±0.15Kg
1 day after	107.2±4.3	124.6±6.5	3.32±0.24	2.41±0.19
2 days after	106.1±5.0	123.0±5.5	3.29±0.16	2.41±0.17
3 days after	105.0±4.8	123.6±4.1	3.34±0.22	2.50±0.23
4 days after	106.7±4.6	124.3±5.3	3.35±0.24	2.51±0.13
5 days after	105.3±4.8	124.2±5.6	3.31±0.20	2.56±0.23
6 days after	106.4±4.4	124.8±5.7	3.33±0.20	2.41±0.17

* Lobectomy at 70 days of age
** Lobectomy at 224 days of age
*** No. of birds

3) *Influence of biopsy on egg production and copulation ability* : Egg production ratios for a month before and after the operation are shown in Table 3.

Table 3. Egg production ratios for a month before and after operation.

Bird	Period of the egg production record		Egg production ratio*
Japanese quail	Before operation	100-130 age in days	84.3%
	After operation	131-161 age in days	83.6%
Chicken	Before operation	160-190 age in days	77.3%
	After operation	191-221 age in days	87.5%

* Hen-day egg production ratio

In the quail, there was no difference in egg production between before and after operation. In the chicken, egg production after operation was slighty higher than that before operation. It may be inferred that this increase in the chicken was due to the advancing age rather than to biopsy. As for copulation ability of male bird, operated male was able to copulate immediately after operation.

4) *Regeneration of liver*: To reseach regeneration of liver of quail lobectomized at immature

stage, quail was killed at adult stage (70 days of age), and its liver was compared with that of the untreated quail (Fig. 7). Authors could not confirm the liver regeneration in the part of lobe lobectomized at immature stage (the part shown by arrow in Fig. 7).

Summary

In this study, authors established an easy method of liver biopsy in the quail and the chicken. Liver biopsy was very easy and safe in both immature and mature stages. In this method, the liver excised had a weight varying from 1000 to 1200 mg in adult chicken and from 80 to 130 mg in adult quail. These weights are certainly the sizable amount of liver for biochemical analysis. Viability, egg production ability, copulation ability and growth after operation were not affected by the biopsy

References

1) R. RONCALLI: Poultry Sci., **49**, 1357, 1970.

Fig. 1. Fastening and picking

Fig. 2. Incision

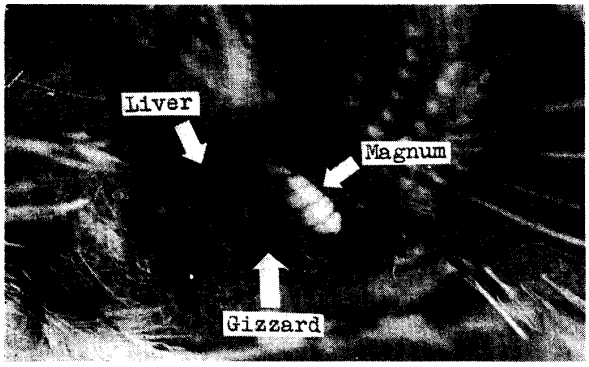


Fig. 3. Location of liver, gizzard and magnum

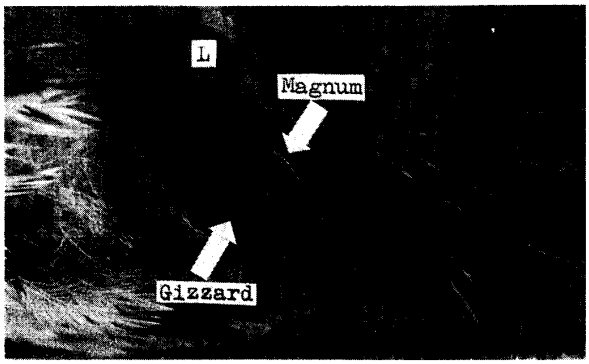
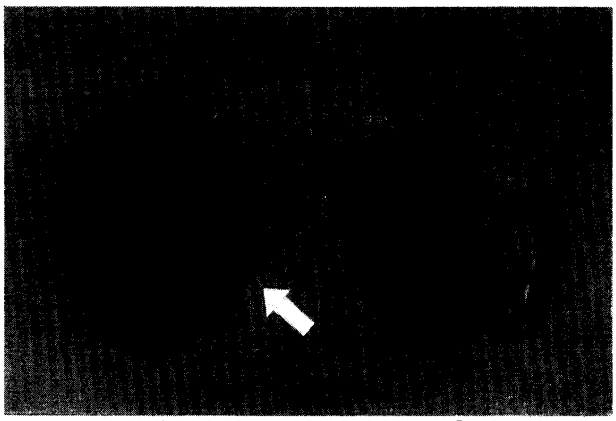


Fig. 4. After lobectomy
L : edge of liver that was lobectomized

Fig. 5. Suture of the *Mm. abdominis*

Fig. 6. Suture of the skin



A B

Researching of regeneration of liver

Fig. 7. A : Liver of quail lobectomized at 28 days of age. The regeneration was observed at 70 days of age (the part shown by arrow).
B : liver of unoperated quail