EFFECTS OF PREPUBERTAL CASTRATION ON THE THYMUS AND THYROID GLANDS OF MALE ALBINO RATS

THESIS

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BY

NAHLA MAHER AFIFI

M.B.,B.Ch.

SUPERVISORS

Prof. Dr. Yehia Youssef Ahmed
Prof. & Head of Anatomy Department
Faculty of Medicine
Ain Shams University

Prof. Dr. Sawsan Abdel Hamid Tantawy
Prof. of Anatomy
Faculty of Medicine
Ain Shams University

Prof. Dr. Wagdy Mahmmod Ghali
Prof. of Anatomy
Faculty of Medicine
Ain Shams University

Prof. Dr. El Erian Youssef Ekladious
Assist. Prof. of Anatomy
Faculty of Medicine
Ain Shams University

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

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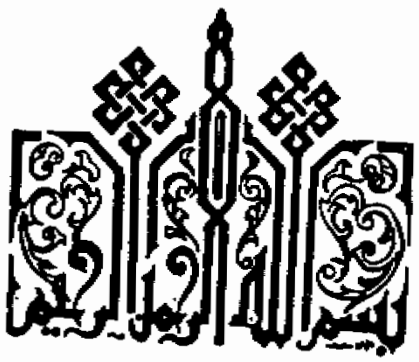

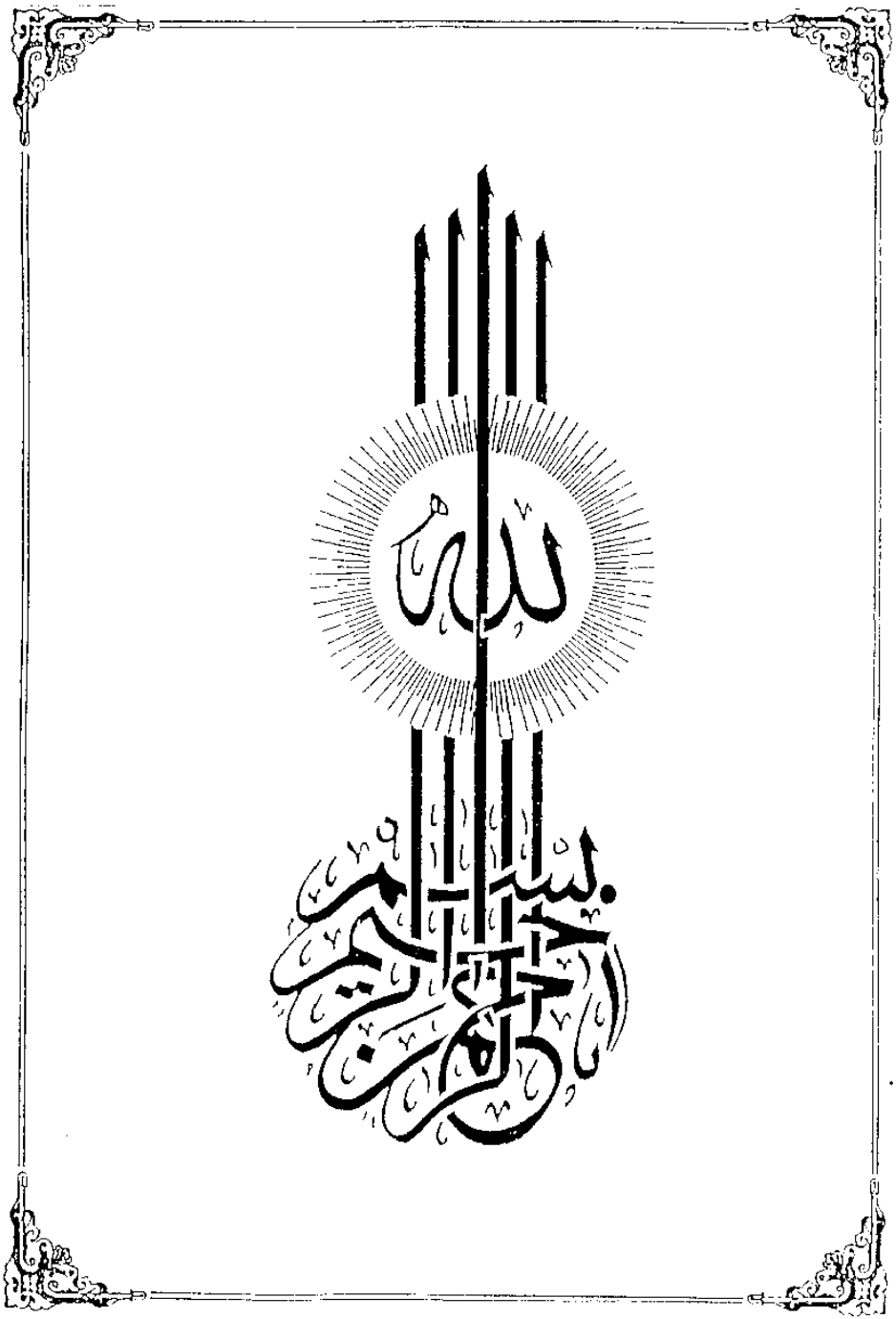

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INTRODUCTION

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Reviewing the literature, it was found that many authors investigated the effect of castration on body weight in adult animals. They reported that it depends on species and sex (Hausberger & Hausberger, 1960; Swanson, 1969; Kakolewski & Valenstein, 1968 and Gentry & Wade, 1976).

Moreover, several investigators studied the effect of castration in adult animals on thymus (Plagge, 1941; Scherzer & Isler, 1963; Westphal, 1971; Pearce et al., 1981 and Black et al., 1984) and thyroid (Okneff, 1922; Leathem & Jamesh, 1948; Wisniewski et al., 1959; Kowalewski, 1969 and Bagchi et al., 1984).

Few authors investigated the effect of castration in premature animals on body weight (Kral et al., 1976; Faust et al., 1984 and Owens et al., 1986), thymus (Chiodi & Hugo, 1938; Reinhardt et al., 1942 and Castro, 1974) and thyroid (Hati, 1915; Anderson & Kennedy, 1933; Mercier et al., 1952; Sinch, 1969 and Christinson et al., 1981).

The aim of the present study was to reinvestigate the effect of prepubertal castration on the body weight, thymus and thyroid gland.

REVIEW OF LITERATURE

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EFFECT OF CASTRATION ON BODY WEIGHT

Rubinstein, Abarbanei and Kurland (1939), stated that castration of male albino rats aged 22 days resulted in decrease of body weight and in the length of the operated animals.

Nagra, Clerece and Roberp (1963), found that intact and castrated adult male pheasants undergo annual cyclic changes in body weight, which was minimum in summer, maximum in spring, and the increase in weight was always larger in intact birds than in castrated. It grows markedly during breeding season and slightly during autum. In castrated birds there was no growth during the breeding season.

Hausberger and Hausberger (1966), found that there was increase in body weight in black littermates of mice castrated at age of 4 to 5 weeks and sacrificed 4 months later, and this was due to increase in fat deposition. They also found adrenal cortical hypertrophy and hypertrophy of islets of Langerhans, and they suggested that the hormonal imbalance due to castration produced changes

in the secretion of adrenal cortical hormones which stimulated islets cell hypertrophy and increased insulin production with subsequent accelerated fat deposition.

Swanson (1967), demonstrated that, unlike rats, the adult female hamster was heavier and longer than the male of comparable age. Gonadectomy of adult stage did not affect growth of the female but resulted in significant acceleration of ponderal and linear growth. The small size of the male hamster appeared to depend therefore, on the presence of androgens.

Kakolewsk, Cox and Valenstein (1968), studied the effect of castration on the body weight in adult male albino rats. They found that there were reduction in food intake and rate of weight gain in adult male rats.

Kowalewski (1969), found that in hamsters, intact 17 weeks old females were heavier than males of the same age. After prepubertal gonadectomy in young hamsters of both sexes at the age of 21 days, the growth of males was accelerated compared with females of the same age. Furthermore, it exceeded the weight of the female at the end of 14^{th} week.

Gentry and Wade (1976), studied the effect of androgen on food intake and body weight in male rats. They castrated rats at different ages; 3 weeks, 3 months and 6 months. They found that there was reduction in the body weight of each group compared with control at same environmental conditions.

Louca, Economides and Hancock (1977), studied the effect of early castration at 7 days of age on growth, food conversion efficiency on damascus goats. They found that the intact male kids grew faster and used food more efficiently than castrated goats, until they were about one month old.

Hahn, Zoltan and Lenard (1977), found that, there were aphagia, body weight loss and postoperative mortality following prepubertal castration of male and female albino rats. All these changes were more severe in males than in females. Artificial food and water administration was ineffective in abolishing the difference in body weight changes between males and females.

Faust, Johnson and Kral (1984), studied the effects of castration on body weight and adipose tissue regrowth in prepubertal and postpubertal male albino rats. They

found a decrease in body weight of pre and postpubertal castrated rats as compared to control at same age. However, they found that there was no inhibition of adipose tissue growth. So they concluded that, while body weight was decreased by castration, percentage of body fat was increased.

Schoutens, Verhas, Baleriaux and Verschaerey (1984), studied the effect of orchidectomy in postpubertal albino rats. The animals were sacrificed after 13, 31, 51, 86 and 120 days. They found that the body weight was diminished only after 2 months, and up to 2 months the growth curve of castrated rats and controls was similar. On the 120^{th} day, the mean body weight was 87% of controls. They considered that the decrease in the body weight of young male postpubertal castrated rats, was mainly due to physiological bone response which followed androgen depriviation in which there was actual slowing down of bone growth. They also found that testosterone replacement therapy induced an increase in bone deposition rate and reduced the number of osteoclasts. It inhibited the negative effect of castration on growth.

Owens, Cimino and Donnelly (1986), stated that, castration reduced body weight of male rats while

treatment with diethyl stilbesterol (D.E.S.) increased it in the castrated animals.

EFFECT OF CASTRATION ON THYMUS GLAND

Chiodi and Hugo (1938a), studied the effect of prepubertal castration on the thymus and lymph nodes of male albino rats aged 30 days. They found that the weight of the thymus increased up to 100 days in the operated and up to 80 days in the controls. Then a rapid decrease was seen up to 120 days in both groups after which a gradual decrease took place. The relative weight of the thymus decreased in both groups from the 45^{th} day onward. They also observed that, the thymus of the castrated rats had a slightly greater proportion of cortex than that of the controls, but no significant differences were observed between both groups in respect to histological aspect or intensity of involution. The involution began little later but was more marked in the castrated rats.

Chiodi and Hugo (1938c), studied the effect of castration on the thymus of adult male and female rats, which were killed 30, 45 and 60 days after castration. The weight of the thymus compared with that of normal controls revealed marked hypertrophy with no qualitative changes in the microscopic aspect.

Chiodi (1940), noticed that castration of male mice

either prepubertal or postpubertal was followed by an increase in the mass of peripheral lymph nodes, spleen and thymus. He said that castration before puberty delayed the onset of thymic involution which normally takes place at puberty and instead produced thymic hypertrophy. However, castration after puberty reversed thymic involution and also led to thymic hypertrophy. Along with the increase in thymic mass induced by castration there were structural alterations in the thymus of castrated animals. The size of the cortex and medulla were increased in the thymic tissue in castrated male and female mice, and the cellular density was greater than that of the control.

Plagge (1941), studied the effect of orchidectomy on male albino rats at various ages. He found increased thymic mass in all castrated animals, but he did not differentiate between pre and postpubertal orchidectomy. He suggested that testicular hormones exerted a constant moderating influence on lymphoid tissue throughout life.

Reinhardt and Wainman (1942), observed that castration of premature albino rats produced thymic enlargement, and this thymic enlargement was reversed by testosterone therapy.