



Pattern of lipid fractions in plasma and cardiovascular tissues under Cryptorchidism in albino rat

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Abstract: Bilateral cryptorchidism was induced surgically in adult wistar strain male albino rats and lipid fractions such as total lipids, total cholesterol, Free cholesterol, Esterified cholesterol, phospholipids, Triglycerides and free fatty acids were analysed in the plasma, heart and dorsal aorta. The lipid fractions such as triglycerides (56.63%), free (20.82%) and esterified (61.25%) cholesterol as well as fatty acids in glycerol (64.42%) had significant elevation in the plasma of cryptorchid animals. Similarly LDL lipid fractions (64.99%) were also elevated markedly under cryptorchid conditions which are the markers of the obesity and atherosclerosis. The lipid fractions such as triglycerides (50.47%, 48.17%), cholesterol (74.64%, 67.7%) and phospholipids (42.04%, 68.88%) showed significant elevations in the heart and dorsal aorta of the cryptorchid animals over the control. The heart, dorsal aorta and plasma had significant accumulation of triglycerides and cholesterol fractions, suggesting the possible deposition of lipid fractions in the tissues, which can be attributed to the possible suppression in the mobilization of lipid fractions into energy metabolism. Such an accumulation of lipid fractions under cryptorchid condition can be considered as the development of risk factor for the cardio-vascular disorders.

Keywords: Cryptorchidism, Albino rat, Lipid fractions, Cardiovascular, Tissues-Plasma

INTRODUCTION

Cryptorchidism is one of the important factors which causes infertility in male (Rijli *et al.*, 1995 and Malyshkin, 1997). Cryptorchidism induced testis cell degeneration is mediated by apoptosis probably as the result of increased in testicular temperature. Farouqui *et al.* (1997) reported that cryptorchid testes exhibited marked degenerative changes in the seminiferous tubules and spermatogonia, impaired and incomplete spermatogenesis. Sertoli cells play a major role in regulating spermatogenesis. Impaired sertoli cells. Which is a marker of sertoli cell function (Demura *et al.*, 1987). Wu and Muroso (1996) reported that a novel serbli cell secreted mitogenic factor stimulated proliferation, decreased testosterone formation and Luteinizing hormone/ human chorionic gonadotropin receptor levels. Temperature increased both the secretion of this factor by sertoli cells and responsiveness of Leydig cells to this factor (Wu and Muroso 1996). Cryptorchidism and elevation of testicular temperature disturb the elevation of biochemical activities (Main and Waites, 1997). Changes in the hormonal profiles and altered cellular functions in the atrophied tubules might reflect on the metabolic activities of damaged testes (Veracruz *et al.* 1970 and Shizume, 1987). Galan *et al.* (1991) reported new born with cryptorchidism has a congenital heart defect. However there are no evidences on the reasons

for cardio vascular disorders in cryptorchid animals. Hence the present study has been under taken to study the effect of the cryptorchidism on the distribution of lipid fractions in the plasma and cardio vascular tissues.

MATERIALS AND METHODS

Adult male Wistar strain albino rats weighing about 125 ± 5 g and 100 ± 5 days ages were selected for experimentation and they were divided into 2 batches. Each batch consists of 8 rats. The first batch was treated as control and the second as experimental. The control rats were anaesthetized with anaesthetic ether, perineal area shaved, swabbed with 95% ethanol, 1 cm long bilateral incisions were made at the level of the inguinal canals, sutured and treated as sham operated. The second batch rats were anaesthetized with anaesthetic ether and 1 cm long bilateral incisions were made at the level of inguinal canals and testes were carefully translocated into abdominal cavity with blunt forceps. Care was taken to avoid damage to the testicular artery. Both the inguinal canals have been sutured with silk thread to prevent the descent of the testes from abdominal cavity. The experimental and sham operated rats were maintained at laboratory conditions ($26 \pm 2^{\circ}\text{C}$ and 12 hrs of light and 12 hrs of darkness), fed on standard rat diet (Hindustan Lever Ltd., Mumbai) and water was supplied ad libitum for a period of 60 days. On the 61st day the animals were sacrificed by cervical dislocation and the tissues were

Table 1. Showing the alterations in lipid fractions of plasma, heart, dorsal aorta of control and cryptorchid rats. Mean \pm S.D of eight observations each.

Parameter	Plasma		Heart		Dorsal Aorta	
	Control*	Experimental*	Control**	Experimental**	Control**	Experimental**
Total lipids	326.13 \pm 2.14	496.48 \pm 3.25 + 52.23 +	37.88 \pm 0.95	50.82 \pm 0.88 + 34.16 +	43.90 \pm 1.275	67.563 \pm 1.303 + 53.9 +
Total Cholesterol	92.59 \pm 2.24	146.41 \pm 2.38 + 58.12 +	1.412 \pm 0.03	2.466 \pm 0.03 + 74.64 +	2.44 \pm 0.077	4.092 \pm 0.173 + 67.7 +
Free Cholesterol	24.39 \pm 1.031	29.47 \pm 1.46 + 20.82 +	0.522 \pm 0.009	0.950 \pm 0.013 + 82.0 +	0.705 \pm 0.045	1.199 \pm 0.088 + 70.07 +
Esterified Cholesterol	68.13 \pm 1.37	109.86 \pm 1.82 + 61.25 +	0.92 \pm 0.055	1.496 \pm 0.018 + 62.6 +	1.71 \pm 0.011	2.827 \pm 0.004 + 65.32 +
HDL Cholesterol	84.34 \pm 1.27	57.13 \pm 1.28 - 32.26 +	NA	NA	NA	NA
LDL Cholesterol	69.67 \pm 1.36	114.95 \pm 1.47 + 64.99 +	NA	NA	NA	NA
Triglycerides	31.41 \pm 0.58	49.2 \pm 0.72 +56.63 +	2.988 \pm 0.043	4.496 \pm 0.022 +50.47 +	3.186 \pm 0.016	4.721 \pm 0.037 + 48.17 +
Phospholipids	25.18 \pm 1.42	38.4 \pm 1.18 + 52.5 +	23.69 \pm 0.33	33.65 \pm 0.48 + 42.04 +	3.60 \pm 0.117	6.08 \pm 0.449 + 68.88 +
Free Fatty acids	25.61 \pm 0.74	42.11 \pm 0.87 + 64.42 +	13.233 \pm 0.191	22.535 \pm 0.665 + 70.3 +	25.20 \pm 0.438	33.495 \pm 0.351 + 32.91 +

+ % Increase; - % Decrease; * Values are in mg / 100 ml of blood; ** Values are in mg / gm dry wt. of the tissue.
NA : Not applicable; + Significant level ($P < 0.001$).

isolated carefully, chilled rapidly in ice box and utilized for biochemical analysis. The blood of these animals was collected. Plasma was separated from the blood and stored in cold (0°C) and used for biochemical studies. The total lipids (Folch *et al.*, 1969), total cholesterol and Esterified cholesterol (Natelson, 1971a), phospholipids (Zelversmidth and Davis, 1950), Free Fatty acids (Natelson, 1971b), triacyl glycerol (Netelson, 1971c), HDL cholesterol (Burststein and Chen, 1970). LDL cholesterol (Friedewald *et al.*, 1972), were estimated in plasma, heart and dorsal aorta.

RESULTS

The total lipid, total cholesterol, free cholesterol esterified

cholesterol, and LDL cholesterol contents of the plasma were significantly increased over the control in cryptorchid animals. HDL cholesterol content was decreased over the control. Similarly triglycerides, phospholipids, free fatty acids contents in plasma were significantly elevated in the cryptorchid animals over the controls (Table 1).

The cardiac tissue of the cryptorchid animals showed an overall increase in the lipid fractions over the controls. The total, free and esterified cholesterol levels were significantly increased in cryptorchid rats over the controls. Cardiac tissue also showed elevated levels of phospholipids, triglycerides and free fatty acids under abdominal condition of the testis. Similarly the lipid

fractions of dorsal aorta were also increased conspicuously under cryptorchid condition. (Table 1)

DISCUSSION

The cryptorchid condition of the testis resulted into overall elevation in the plasma lipid fractions when compared to the controls. The total lipid content of the plasma was significantly higher, indicating either increased addition from synthetic sites or decreased utilization by the tissue. The tissue metabolism in male body has a direct relationship with the testosterone level of circulation (Chase *et al.*, 1957 and Zipt *et al.*, 1978). Since there was significant decrease in the circulating levels of testosterone in cryptorchid animals, (Friedman *et al.*, 1994 Wu and Muroso, 1996). The possibility of suppressed oxidative metabolism of the tissues can be expected. Since the plasma lipids were actively taken up by the tissues into oxidative metabolism, the suppressed metabolic activities of the tissue seem to be responsible for the accumulated lipid fractions in the plasma. The cholesterol fractions were largely accumulated with particular reference to LDL cholesterol, which may be due to decreased steroidogenesis in the body under cryptorchid condition (Pereira *et al.*, 1993 and Friedman *et al.*, 1994). Therefore, the accumulated plasma lipid fractions in the cryptorchid animals suggests the possibility of cardio vascular risk factor.

The cardiac tissue accumulated the lipid fraction under cryptorchid condition, which can be related to the decreased metabolic activities of the tissue. The accumulation of lipid fractions with particular reference to triglycerides in the cardiac tissue may be prone to cardiac disorders. Similarly dorsal aorta also had marked accumulation of the lipid fractions under cryptorchid condition, which can be comparable to a condition of atherosclerosis (Morimoto *et al.*, 1986; Nossen *et al.*, 1986).

Thus the cardio vascular tissues had remarkable accumulation of lipid fractions under the cryptorchid condition, comparable to the major cardio vascular disorders, the results of the present study were indicative of generating of risk factors for the cardio vascular disorders under cryptorchid condition.

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