Original Research Article

Correlation of serum testosterone and testicular volume in patients with cirrhosis

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Abstract

Background: There are certain features of liver disease such as the 'characteristic' skin changes which are attributed to altered hormone metabolism. The close relationship between liver disease and the gonads appears to be obvious. **Methods:** Our study is planned to compare the serum testosterone and testicular volume between the cirrhotic patients and age matched healthy normal controls and between Alcoholic liver cirrhosis patients and Non-Alcoholic liver cirrhosis patients. **Results:** We found the serum testosterone level and testicular volume was significantly low in cirrhotic patients compared to the age matched healthy normal controls. **Conclusion:** In cirrhotic patients, the serum testosterone level was significantly lower side compared to the controls and the testicular volume also was in the lower side. This may explain the pathophysiology of hypogonadism in male cirrhotics. Some of these patients had the significant testicular atrophy but the testosterone level and testicular volume were not correlated with the severity of the disease as defined by child-Pugh's classification

Key Words: Alcoholic cirrhosis, Nonalcoholic cirrhosis, Serum testosterone, Testicular volume.

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Received Date: 11/04/2019 Revised Date: 30/05/2019 Accepted Date: 18/07/2019
DOI: https://doi.org/10.26611/10211128

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 08 August 2019

INTRODUCTION

Liver is an important organ with various metabolic functions including inactivation of hormones. Hence liver disease is accompanied by endocrine disturbances and 'characteristic' skin changes due to altered hormone metabolism. In male with liver disease, gynaecomastia and change in the secondary hair distribution with loss of axillary and chest hair and a female distribution of pubic hair are seen. In severe disease there is Loss of libido, impotence and testicular atrophy. Oligospermia is also documented[1]. The close relationship between liver disease and the gonads appears to be obvious and therefore we attempt to correlate cirrhotic liver disease with disturbances in gonadal function by measuring testicular volume and serum testosterone.

AIM

- To compare the serum Testosterone level and testicular volume between Cirrhotic patients and the healthy normal controls.
- To compare the serum Testosterone level and testicular volume between Alcoholic liver cirrhosis and Non- Alcoholic liver cirrhosis.

MATERIALS AND METHODS

This is a prospective randomized study conducted at Indira Gandhi Medical College and research institute, Puducherry. After obtained Ethical committee clearance from the Institution 25 male cirrhotic patients aged between 20years to 60 years, were selected from the Medical OPD and Medical ward according to the inclusion and exclusion criteria. All the patients underwent the routine investigations and liver profile and the patients were classified according to child-Pugh's classification. 25 male healthy volunteers were selected

How to cite this article: G RajeshKumar, E Rajalakshmi. Correlation of serum testosterone and testicular volume in patients with cirrhosis. *MedPulse International Journal of Medicine.* August 2019; 11(2): 101-104. https://www.medpulse.in/Medicine/

and after taking consent, routine investigations and liver profile were done for all these patients. All the cirrhotic patients and controls underwent the following special investigations.

- Total Serum Testosterone level (normal level: 300-1000 ng/dl)- chemilumniscent method
- Testicular volume by ultra sonography gray scale.

All the data were analyzed in the SPSS 11.5 version for windows. Mean, Standard deviation, Pearson's correlation efficient were used to identify the significance of this study. P value < 0.05 is considered statistically significant.

Inclusion Criteria:

- Age more than 20 years and below 60 years.
- All patients with cirrhosis of the liver detected by USG and clinical parameters.

Exclusion Criteria:

- Age below 20 years and above 60 years
- Hepatocellular carcinoma detected by USG.
- Taking alcohol in the past 6 months.
- History of pyrexia in the past 4 weeks.

OBSERVATION AND RESULTS

Table 1: Serum testosterone level and testicular volume between age matched cases and controls

Age group (years)	S.testosterone (ng/dl) Mean		Testicular volume (ml) Mean		Child-pugh class (cases)		
	Case	Control	Cases	Control	A	B	C
20-30 years	237.73	604.64	8.52	19.07	0	4	0
No of patients	4	6	4	6			
31-40 years	179.50	609.50	7.86	18.42	2	3	3
No of patients	8	6	8	6			
41-50 years	168.68	524.67	8.44	17.74	2	2	2
No of patients	6	6	6	6			
51-60 years	170.69	375.52	6.8	14.59	1	5	1
No of patients	7	7	7	7			

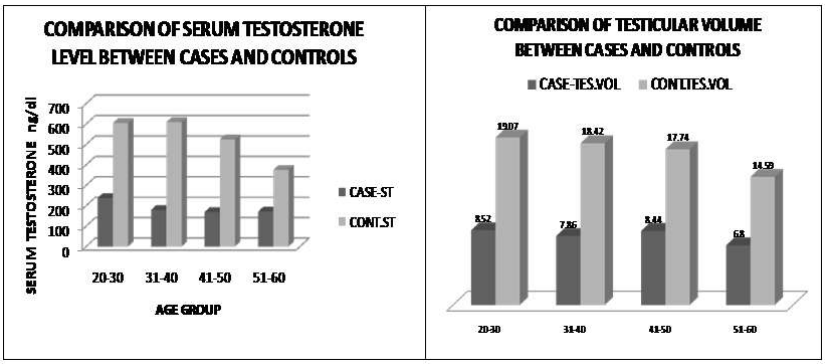

Figure 1-2

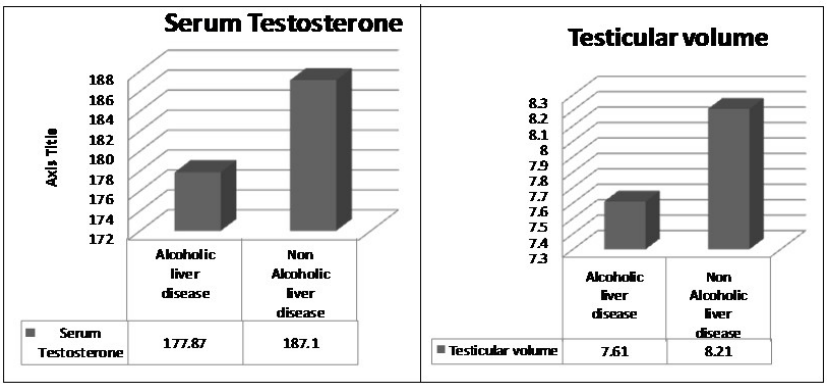

Figure 3 Figure 4

Figure 1-2 :Comparison of serum testosterone level and testicular volume between cases and controls
Figure 3: Comparison of serum testosterone level between alcoholic and non alcoholic cirrhosis
Figure 4: Comparison of testicular volume between alcoholic and non alcoholic cirrhosis

DISCUSSION

The mean testosterone level was 183.78ng/dl with SD ± 99.73 in cases and 522.46ng/dl in controls with SD ± 120.90. The difference was statistically significant in independent T-test with a Sig. (2-tailed) 0.000. In age matched groups, in the age group 20-30years, the mean testosterone level were 237.73ng/dl in cases and 604.64ng/dl in controls. In the age group of 31-40years, the mean testosterone levels were 179.5ng/dl in cases and 609.5ng/dl in controls. In the age group of 41-50years, the mean testosterone levels were 168.68ng/dl in cases and 524.67ng/dl in controls. In the age group of 51-60years, the mean testosterone levels were 170.69ng/dl in cases and 372.52ng/dl in controls. The mean testicular volume was 7.80 with SD ± 2.73 in cases and 17.43 in controls with SD ± 2.32. The difference was statistically significant in independent T-test with a Sig. (2-tailed) 0.000. In age matched groups, in the age group 20-30years, the mean testicular volume was 8.52ml in cases and 19.07ml in controls. In the age group of 31-40years, the mean testicular volume was 7.86ml in cases and 18.42ml in controls. In the age group of 41-50years, the mean testicular volume was 8.44ml in cases and 17.74ml in controls. In the age group of 51-60years, the mean testicular volume was 6.8ml in cases and 14.59ml in controls. Our results are comparable with similar study done by Zbigniew Jabłonowski et.al [2] where they studied the serum testosterone level in 21 cases with compensated alcoholic cirrhosis without controls and they found the mean testosterone level was 8.89 μmol/l (ranged: 7.4–10.9 μmol/l) in the study patients [the normal range interval: 8.2–34.6 μmol/l]. The level was found to be normal range in 4 patients, and the remaining patients had low normal range. The testicular volume of both testes were low in patients with compensated alcoholic liver cirrhosis in comparison to healthy controls ($p<0,001$) which is statistically significant. The serum testosterone level and testicular volume were not correlated with the severity of disease defined by Child-Pugh's classification. This is comparable with another study done by Guechot J *et al* showed in alcoholic cirrhosis the hepatic uptake of sex steroids depends on not just by the degree of liver function impairment but also to the degree to which they bound to sex hormone binding globulin[3].Serum testosterone level between Alcoholic and Non Alcoholic liver disease were 177.87 and 187.1 ng/dl respectively. Testicular volume between Alcoholic and Non Alcoholic liver disease were 7.61 and 8.21 ml respectively. Hypogonadism is more common in alcoholic than nonalcoholic liver disease due to direct toxic effect of ethanol on testes[4]. This is proved by a study by Asterios Karagiannis *et al* and Faidon Harsoulis *et al*. In contrast there ia an another study by Sabahattin Kaymakoglu *et al* who concluded etiology of liver cirrhosis have no relation to hypogonadism and the severity of liver failure is directly proportional to hypogonadism and feminization[5].Bruno T. Zacharias *et al* studied hypothalamic–pituitary-gonadal function in men before and after liver transplantation concluded male cirrhotic patients with hypogonadism had normal FSH and LH which got increased and increased E2 and LRP which became normal after liver transplantation. The changes in FSH, PRL and LH is not influenced by severity of liver disease unlike change in E2 level[6] .Yuan-Jen Wang *et al* studied Changes of sex hormone levels in patients with hepatitis B virus-related postnecrotic cirrhosis and its relation to the severity of portal hypertension and concluded impotence and low testosterone are found in these patients and liver disease as such causes male gonadal dysfunction and hypothalamic pituitary axis dysfunction also have a role in dysfunction of gonads and level of sex hormones[7].Bahnsen M *et al* did a study on Pituitary-testicular function in patients with alcoholic cirrhosis of the liver and found that there was increased level of sex hormone binding globulin, decreased dehydro-epiandrosterone but no significant difference in testosterone level from controls. There is also decreased secretion of gonadotropins in addition to primary hypogonadism. Hyperoestrogenemic state and concentration of gonadotropins has significant relation with hepatic synthesis of coagulation factors[8]. L. De Besi *et al* did a study on sex hormones and sex hormone binding globulin in males with compensated and decompensated cirrhosis of liver and he found that the hormonal patterns of gonadal failure, steroid metabolism and transport impairment depends on the degree of liver dysfunction[9]. A Louis Southren *et al* studied androgen metabolism in cirrhosis of the liver and conclusion was hypothalamic pituitary suppression due to increased estrogen level also decreases the testosterone level in addition to primary hypogonadism and it is consistent with increased conversion of testosterone to androstenedione [10].

P. Bannister *et al* did a study on sex hormone changes in chronic liver disease comparing alcoholic and non alcoholic liver disease and came to a conclusion that sexual dysfunction is more in alcoholic liver disease and also serum testosterone and androstenidione levels were lower[11] .Franz C *et al* did a study on Estrone sulfate and dehydroepiandrosterone sulfate concentration in cirrhotic men and concluded there was lower level of both levels in men with cirrhosis which proves the defect in sulfurylation in these patients [12].Kley HK *et al* conducted a study on steroid hormones and their binding in male

patients with fatty liver, chronic hepatitis and liver cirrhosis and got a conclusion that an altered liver function found in both patients with liver disease and in old men is responsible for decreased E1 and E2 and reduced testosterone with increased sex hormone binding globulin causing hypogonadism and gynaecomastia [13].Yohitsugu M *et al* did a study on gonadal dysfunctions in liver cirrhosis and his conclusion was Hypogonadism in male cirrhotic is because of alcohol abuse per se and not due to liver cirrhosis and feminization is due to hyperestrogenemic state [14].Yoshiyuki maruyama conducted a study about mechanism of feminization with nonalcoholic male cirrhotics and found that serum testosterone level is regulated by serum hormone binding globulin whichn is responsible for feminization in these patients[15].

CONCLUSIONS

The serum testosterone and the testicular volume was in the lower side in cirrhotics compared to the controls of same age group. This may explain the pathophysiology of hypogonadism in these patients. The severity of the disease as defined by child-Pugh's classification volume was not correlated with the serum testosterone and the testicular volume .Further studies like serum estrogen level required to explain feminization in cirrhotic patients

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