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Urology

TO DETERMINE THE EFFICACY OF L-CARNITINE THERAPY IN SELECTED CASES OF MALE INFERTILITY

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ABSTRACT ***Objective*:** To determine the efficacy of L Carnitine therapy in selected cases of male infertility. ***Methodology:*** A placebo controlled , double blinded, randomised control trial was performed in the Department of Urology MMC and RGGGH for a period of 6 months from March to August 2023. A total of 50 patients were included in the study between ages 20-40 years with the following baseline sperm selection criteria: concentration, 10-20 x 10^6/ml, total motility , 10%-30%; forward motility, <15%; atypical forms, <70%; velocity, 10-30 /s,linearity, <4. These patients were randomized into 2 groups. Group A-25 patients received a placebo and Group B- 25 patients – received 2gm/day L-Carnitine. Control analysis done were Semen volume, Semen concentration, sperm motility. Semen analysis done before starting treatment and after 3 months of treatment. ***Results:*** Improvement in sperm parameters in particular sperm motility was the main outcome measure. A statistically significant improvement in semen quality, greater than after the placebo cycle was seen after L carnitine therapy for sperm concentration and total forward sperm motility. The increase in forward sperm motility was more significant in those patients with lower initial values, i.e.,<5 x 10^6 or <2 x 10^6 of forward motile sperm ejaculate or sperm/mL. ***Conclusions*:** Based on a controlled study of efficacy, L-carnitine therapy was effective in increasing semen quality, especially in groups with lower baseline levels. However, these results need to be confirmed by larger clinical trials and in vitro studies.

KEYWORDS : L-Carnitine,infertility,semen analysis.

INTRODUCTION

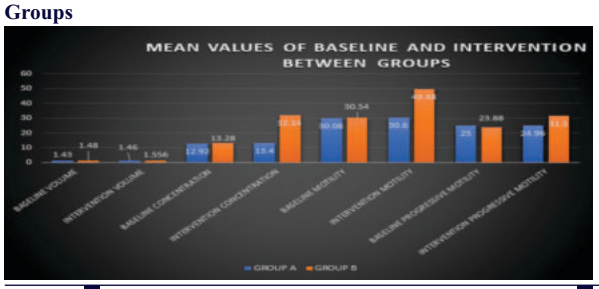
This study was undertaken to determine the efficacy of L Carnitine therapy in selected cases of male infertility. Nowadays birth rates are declining and the causes are complex- be due to urbanization, pollution, advancing parental age. Male factor infertility has been found to be the cause of nearly 50% cases of infertility. L-carnitine in epididymis has been found to provide energetic support for spermatozoa and also helps in successful maturation of sperm. L – carnitine is also necessary for transport of fatty acids into the mitochondria to produce energy. Low levels of L-carnitine leads to decreased sperm motility. It has been seen that fertile men have higher level of L – carnitine. Previous studies have identified a positive correlation of L Carnitine levels with sperm concentration, sperm motility and vitality of sperm cells.

MATERIALS AND METHODS

A Placebo controlled, double blinded randomized control trial was done among 50 patients who presented with urology OPD from March 2023 to August 2023 with male factor infertility. Inclusion criteria were age 20-40 years, sperm concentration -10-20 x 10^6/ml, total motility -10% -30%, forward motility - <15% , atypical forms - <70% and the exclusion criteria were presence of general and endocrinological diseases, present or previous cryptorchidism, genital infections or genital tract obstructions, varicocele and testicular abnormalities. Informed consent was obtained from all participants. These patients were randomized into 2 groups. Group A-25 patients –received a placebo and Group B- 25 patients – received 2gm/day L-Carnitine. Factors analysed included semen volume, semen concentration and sperm motility. Semen analysis was done before starting the treatment and repeated 3 months after treatment. Pregnancy was not considered to be a principal end point. Samples were collected by masturbation after a 3- to 5-days of abstinence.

RESULTS:

Table 1: Mean Values Of Baseline And Intervention Between Groups



To analyze the data SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) and Excel Sheet were used to enter the data. The Normality tests, Kolmogorov-Smirnov and Shapiro-Wilks tests results revealed that the data follows normal distribution. Therefore, to analyze the data, a parametric test was applied. Descriptive statistics determined the mean and standard deviation for the variables. Independent t-test was applied to find the statistical significance for the mean between group A and group B. Paired t-test was applied to find the statistical significance for the mean within Group A and Group B. Significance level is fixed as 5% (α = 0.05). P-value <0.05 is considered to be statistically significant.

All 50 patients completed the study. Data analysis revealed the mean age between both groups to be 28 years. Significant improvement in parameters was noted in the test group compared to the trial group at the end of 3 months.

While none of the parameters showed statistically significant improvement in the control group, significant improvements (p 0.001) were observed in total and progressive motility, sperm concentration and semen volume.

Association of Mean and Standard Deviation for Total volume, total sperm concentration, total motility and progressive motility among the study participants between group A and group B showed statistically significant correlation for total sperm concentration, total motility and progressive motility and not for semen volume.

Table 2 Shows P Value

Placebo total sperm concentration (in million/ml)	**Group A**	**13.40**	**2.733**	**P- 0.001**
L carnitine total sperm concentration (in million/ml)	Group B	32.14	4.463	
Placebo for progressive motility (in %)	Group A	24.96	0.856	0.001*
L carnitine for progressive motility (in %)	Group B	31.50	2.410	

DISCUSSION

In recent years, various assisted reproduction techniques have emerged as potential solutions for infertility attributed to male factors. However, they have simultaneously hindered the advancement of new approaches for treating male factor infertility. Clinical studies in this realm face common challenges typical of all trials, along with some unique obstacles: criteria for case selection, patient willingness to accept a placebo period, variables that need to be examined, sperm characteristics (which can vary spontaneously), sperm function assays

(still lacking standardization), rates of spontaneous pregnancies (influenced by female factors), and the in vitro fertilization success rate (which should be elevated to detect meaningful differences).

Regrettably, many medications are utilized to treat male factor infertility without any solid justification; these treatments are frequently administered in succession with no beneficial outcomes, and any perceived enhancements in semen quality often lack a genuine foundation and may simply result from natural variations in semen characteristics. Several of these treatments were previously suggested in the international literature and received significant criticism. The purported aim is to enhance spermatogenesis, increase the quality of sperm populations, and influence sperm maturation, energetic metabolism, and the testicular-epididymal microenvironment.

Among the proposed actions, targeting postgonadal maturation could be a rational and intriguing option, particularly since this process mainly takes place in the epididymal fluid, where spermatozoa are separated from the intricate and still not fully understood hormonal network within the testis. In the epididymis, the epithelial cells eliminate certain testicular factors, absorb substances from the bloodstream, and generate specific compounds, all of which are beneficial for sperm maturation and motility. In mammalian epididymis, one notable component is free L-carnitine, which is absorbed from blood plasma, transported into the epididymal fluid, and then into the spermatozoa, where it accumulates in both its free form and as acetylated L-carnitine. This small quaternary amine, free L-carnitine, ranks as one of the most abundant water-soluble polar compounds found at the epididymal level, being concentration-wise hundreds of times higher than in blood.

Previous studies showed a notable rise in sperm straightness and the insignificant fluctuation in sperm speed suggesting a selective process. Impact on the qualitative aspects of sperm movement. These findings demonstrate a potential effect of L-carnitine in instances of extremely severe OAT (for example, sperm motility below 10%).

Vitali et al in 1995 demonstrated a beneficial effect of L carnitine on sperm motility in 60 % of participants. A study by Rosa et al in 2005 analysed seminal parameters and seminal carnitine levels in those taking L carnitine supplement showed improved sperm concentration and motility, correlating with findings in our study.

A systematic review done in 2007 by Xin Zhou et al analysed effect of L carnitine in nutritional treatment of male infertility showed improvement in total sperm motility, forward motility, decrease in atypical forms, however not much difference in sperm concentration was noted in contravention to our findings.

CONCLUSION

- L-carnitine therapy effective in increasing semen quality, especially in groups with lower baseline levels
- To be confirmed by larger clinical trials

Conflicts Of Interest None.

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