

EFFECT OF ZINC ADMINISTRATION ON SEMINAL ZINC AND FERTILITY OF OLIGOSPERMIC MALES

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Summary : Fourteen infertile males (age 24-45 years; married over 2 years) with idiopathic oligospermia (sperm count <40 millions/ml) were investigated for the effect of oral zinc sulphate (220 mg) for 4 months on their serum and seminal zinc levels, and seminal parameters. With zinc administration serum zinc levels remained essentially unaffected, however, seminal zinc levels increased significantly. There was significant improvement in sperm count, number of progressively motile and normal spermatozoa, and acid phosphates activity. Wives of 3 patients conceived. Observations suggest that zinc has potential to be used in male infertility. However, further studies are warranted.

Key words : zinc oligospermia infertility

INTRODUCTION

Role of trace elements like Zinc, in various physiological processes has received considerable attention during last few decades. It has been reported that Zinc is essential for the action of over 80 metallo-enzymes and plays an important role in polymeric organisation of macromolecules such as RNA and DNA, protein synthesis, cell division and stability of biomembranes (6, 16). In relation to male reproduction Zinc has been implicated in maintenance of spermatogenesis, survival of germinal epithelium (14), trophic effect of gonadotrophins on tests and steroidogenesis (10), survival and normal function of spermatozoa and perhaps fertilization (9,11). A Zinc deficient diet was shown to be associated with decrease in sperm count and testosterone levels in middle aged volunteers (1). Such experimental evidences provide a new line of approach in the management of male infertility.

The purpose of present study was to determine the response of serum and seminal Zinc levels and seminal parameters to oral Zinc sulphate therapy in oligospermic infertile males with low seminal plasma zinc levels.

MATERIAL AND METHODS

The study is based on 14 infertile males (age 24-45 years; married for 2-22 years) with consistently low sperm counts. Oligospermia was taken as a sperm count < 40 millions/ml (3), together with significantly subnormal percentage of progressively motile or morphologically normal forms. All the patients underwent detailed history, general and local examination, and routine laboratory investigations to exclude any major systemic or local disease. None of the patient was on any drug for past 6 months. The routine examination of female partners was normal.

The semen samples were collected in clean and dry petridishes after 5 days abstinence, allowed to liquefy at room temperature and examined within one hour. The examination included :

- (a) Routine semen examination, sperm count, percentage of progressive motility, viability and normal forms (15),
- (b) seminal fructose concentration and acid phosphatase activity (15),
- (c) seminal plasma and serum Zinc concentration by atomic absorption spectrophotometry (13) in the Chemical Laboratory, G.S.I., Tilak Nagar, Jaipur.

Both serum and seminal samples were collected and stored in test tubes and petridishes which were washed thoroughly with dilute nitric acid and then rinsed thrice with demineralized water. Any possibility of extraneous Zinc contamination was rigorously avoided during examination also.

After two consecutive examinations spaced at the interval of 1 month to establish pretreatment data, patients were put on 220 mg Zinc sulphate (Cap ZINCOLAK, Shalaks Chemicals) orally, every day (11). Follow up assessments were done monthly for 4 months. Results were analyzed for statistical significance by paired 't' test with each patient serving as his own control.

RESULTS

The pretreatment and post treatment values are summarized in Table I. The pretreatment mean sperm count, progressive motility percentage and seminal acid phosphatase activity were below normal recommended values (7). After 4 months of Zinc sulphate therapy sperm count increased and became normal in 9 out of 14 cases.

The percentage of progressively motile spermatozoa was $>60\%$ in 7 while that of normal and live forms was within normal range in all the patients. Changes in fructose concentration did not follow any specific trend, however, the mean seminal acid phosphatase activity increased significantly,

TABLE I : Effect of oral zinc sulphate on serum and seminal zinc levels, and seminal parameters (Mean \pm SD).

Parameter	Initial	After 4 months
Seminal plasma Zinc ($mg\%$)	7.89 \pm 2.95	21.18 \pm 13.68*
Serum Zinc ($\mu gm\%$)	87.78 \pm 21.08	108.33 \pm 39.20
Serum Count (millions/ml)	19.70 \pm 10.84	50.79 \pm 24.28**
Progressive Motility (%)	21.36 \pm 21.41	34.64 \pm 27.90*
Viability (% live)	60.33 \pm 17.28	70.77 \pm 15.25
Morphology (% normal)	56.75 \pm 10.82	72.69 \pm 11.48**
Fructose ($mg\%$)	262 \pm 91	335 \pm 77
Acid Phosphatase (I.U./ml)	1362 \pm 636	3035 \pm 963**

*P <0.05

**P <0.01

Seminal plasma Zinc concentrations were subnormal in all the cases when compared with the range of 11-14 $mg/100\ ml$ in a healthy fertile group (2). Zinc administration significantly increased seminal plasma Zinc levels. However, serum Zinc levels which were normal in 8 patients and subnormal in test remained essentially unaffected in most of the cases. The normal range of serum Zinc levels was found to be 90-130 $\mu gm/100\ ml$ in a control group of 40 subjects from the same laboratory (12).

Wives of three patients conceived during the period of observation (within 6 months from the start of the zinc therapy). The oral dose of 220 mg daily was well tolerated in our patients.

DISCUSSION

Male infertility poses a challenge to the clinicians because of lack of standard definitions, poor understanding of etiological factors and questionable diagnostic procedures. No specific and effective treatment, therefore, exist for most of the patients.

The elucidation of role of Zinc in human reproduction in recent years, and reports pertaining to the prevalence of Zinc deficiency from many countries advocates trial of this trace element in some selected cases. Few studies have shown therapeutic effect of oral Zinc sulfate in infertile males (5,8,11,17).

On reviewing the 14 cases of the present study we find overall improvement in fertility parameters in 9 out of 14 patients. Prostatic secretory function improved as apparent by significant increase in seminal acid phosphatase activity and seminal plasma Zinc concentration.

The normal serum Zinc levels in most of the patients cannot, however, rule out Zinc deficiency because, it is well known that serum Zinc levels do not truly reflect the body Zinc status (4). The deficiency in seminal plasma can therefore, be an independent occurrence reflecting primarily the secretory activity of the prostate and other accessory sex glands due to infection, low androgenic drive etc. But, whatever be the reason for low Zinc levels in seminal plasma, a primary deficiency of Zinc in the body or a poor secretion into seminal plasma, loading the body with Zinc raises the seminal Zinc levels. This in turn is associated with improved sperm count and motility. The number of patients, however, is not large enough to say whether the improved fertility and the increased seminal Zinc are running parallel to each other. As a matter of fact Zinc is necessary for androgen production by tests, proliferative activity of germ cells and capacitation of spermatozoa. Obviously there is much to be learnt about the prevalence of any Zinc deficiency in our population and its impact on male fertility.

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