



The Effects of Abnormal Prolactin Levels on Semen Parameters on Male White Rats

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ABSTRACT

Introduction: High prolactin levels drastically inhibit sperm production and its quality. The role of high prolactin levels on the male reproductive system has not been completely elucidated and thus its exact role in male factor infertility remains unclear. Hence this study was carried out in order to establish its effects.

Objective: To determine the effects of prolactin levels on semen parameters of male white rats

Methodology: A case control study was carried out in the Animal house of the Faculty of Medicine, University of Ruhuna, Sri Lanka. Ethical consent was obtained from the Ethical review committee, Faculty of Medicine, University of Ruhuna. 10+/- 2 week old, 200+/-10 g weighted Wistar strain male white rats were grouped as G1-G6, with 30 rats per group. They were maintained in separately labeled cages at room temperature of 28+/- degrees Celsius. Hyperprolactinemia was induced in G3, G4 and G5 by using oral lergactil a daily dose of 10mg/kg in two divided doses on G3, and subcutaneous injections of fluphenazine in a dose of 0.42mg/kg and 0.84mg/kg on G4 and G5 respectively given as single dose in the morning. Hypoprolactinaemia was induced in G2 by using oral bromocriptine in a daily dose of 4.65mg/kg in two divided doses. After 100 days PRL levels were assayed together with a BSA assessment on each of the groups. Results were compared with corresponding control groups and with each of the groups.

Results: The difference between the experimentally obtained values and corrected values for the serum PRL concentrations in the G2 which was administered bromocriptine to induce hypoprolactinaemia was found to be highly significant with compared to the control group by student's t-test. The difference between the experimentally obtained values and corrected values for the serum PRL concentrations in the G3, G4, G5 which was administered lergactil, low dose fluphenazine, high dose fluphenazine respectively to induce hyperprolactinaemia was found to be highly significant with compared to the control group by student's t-test. Mortality, morphology, cell counts per field and the concentration of sperms seems to be affected by serum PRL levels.

A correlation between different PRL levels and the semen parameters was evident as those with high PRL levels show more abnormal basic semen analytical parameters while those with a moderate rise of PRL levels and hypoprolactinaemic rats show better basic semen analytical parameters.

Conclusions: The level of serum PRL in white male rats has an effect on semen parameters. The level of effect is proportionate to the level of serum PRL. It is clearly evident that mortality, morphology, cell counts per field and the concentration of sperms are affected by PRL. Thus abnormal PRL levels appear to exert an effect on the spermatogenic cycle.

Key words: male factor infertility, prolactin, seminal fluid analysis

I. INTRODUCTION

Pre testicular causes accounts for up to 10% of male factor infertility. This mainly include hormonal factors including follicular stimulating hormone (FSH), luteinizing hormone (LH), testosterone and prolactin (PRL). High prolactin levels results in a drastic inhibition of sperm production and its quality¹. Prolactin abnormalities results from trauma, pituitary tumours, malformation of the pituitary gland, thyroid dysfunction and genetic abnormalities². The hypothalamo-pituitary hypo function contributes to about 1% of cases³. Hyperprolactinaemia is known to result in decreased libido and impotence. Treatment with bromocriptine suppresses the high PRL levels and results in reversal of these disturbances.

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The role of high PRL levels on the male reproductive system has not been completely elucidated and its exact role in male factor infertility remains unclear. Hence this study was carried out in order to study its effects on the Male Reproductive system and male factor infertility.

II. METHODOLOGY

A case control study was carried out in animal house of Faculty of Medicine, University of Ruhuna, Sri Lanka. Ethical consent was obtained from Ethical review committee, Faculty of Medicine, University of Ruhuna. 10+/- 2 week old, 200+/-10 g weighted Wistar strain male white rats were grouped into G1-G6, 30 rats per each. They were maintained in separately labeled cages at room temperature of 28+/- degrees of Celsius. G1 was maintained under normal conditions at room temperature as a control group with normal PRL levels. G2 was fed with oral bromocriptine in a dose of 4.65mg/ kg body weight per day divided into 2 doses dissolved in 2ml of distilled water. An age, weight matched control group of 30 rats were fed with an equal volume of distilled water.

G3 was fed with oral lergactil in a dose of 10mg/ kg body weight divided into 2 doses a day dissolved in 2ml of distilled water. An age, weight matched control group of 30 rats were fed with an equal volume of distilled water. G4 was given subcutaneous injections of fluphenazine in sesame oil as a single daily dose of 0.42mg/kg body weight. G5 was given subcutaneous injections of fluphenazine in sesame oil as a single daily dose of 0.84mg/kg body weight. G6 served as a control group for the G4 and G5 and were injected with an equal amount of sesame oil. Daily food intake, drug intake, fluid intake and body weight was monitored. Hyperprolactinemia induced in G3, G4 and G5 and hypoprolactinaemia induced in G2 were done according to the dosages recommended by the British National Formulary.

After 100 days PRL levels were assayed together with a BSA assessment on each of the groups. Results were compared with corresponding control groups and with each of the groups.

III. RESULTS

The difference between the obtained values and corrected values for the serum PRL concentrations in the control group was found to be highly significant by student's t-test ($p < 0.001$).

The difference between the experimentally obtained values and corrected values for the serum PRL concentrations in the G2 which was administered bromocriptine to induce hypoprolactinaemia was found to be highly significant with compared to the control group by student's t-test ($p < 0.001$).

The difference between the experimentally obtained values and corrected values for the serum PRL concentrations in the G2 which was administered lergactil to induce hyperprolactinaemia was found to be highly significant with compared to the control group by student's t-test ($p < 0.001$).

The difference between the experimentally obtained values and corrected values for the serum PRL concentrations in the G2 which was administered low dose fluphenazine to induce hyperprolactinaemia was found to be highly significant with compared to the control group by student's t-test ($p < 0.001$).

The difference between the experimentally obtained values and corrected values for the serum PRL concentrations in the G2 which was administered high dose fluphenazine to induce hyperprolactinaemia was found to be highly significant with compared to the control group by student's t-test ($p < 0.001$).

By comparison of basic semen parameters of G2 which was administered bromocriptine to induce hypoprolactinaemia with that of the control group, the difference percentage of the non-progressively motile forms, the motile forms, head abnormalities, tail abnormalities were statistically significant ($p < 0.05$). the differences in the percentage with normal morphology is significant at 95% portability ($p < 0.05$). But the difference in the percentage of progressively motile forms was not significant at a p value of .05 nor the differences in the cells per field after dilution and sperm concentrations ($p > 0.05$).

By comparison of basic semen parameters of G3 which was administered oral lergactil to induce hyperprolactinaemia with that of the control group, the difference percentage of the non-progressively motile forms, the motile forms, head abnormalities, tail abnormalities were statistically significant in the cell counts per field after dilution and sperm concentrations ($p < 0.05$). But the differences in the percentage with progressively motility or the percentage of normal morphology was not significant at 95% portability.

By comparison of basic semen parameters of G4 which was administered low dose fluphenazine to induce hyperprolactinaemia with that of the control group, the difference percentage of the non-progressively motile forms, the motile forms, head abnormalities, the differences in the cells per field after dilution and sperm concentrations were statistically significant ($p < 0.05$). But the difference in the percentage of progressively motile forms or the percentage of normal morphology was not significant at a p value of .05 ($p > 0.05$).

By comparison of basic semen parameters of G5 which was administered high dose fluphenazine to induce hyperprolactinaemia with that of the control group, the difference percentage of the non-progressively motile

forms, the motile forms were statistically significant ($p < 0.05$). The differences in the percentage with tail abnormalities and the cells per field after dilution and sperm concentrations were also significant at a p value of $.05$ ($p > 0.05$).

But the difference in the percentage of head abnormalities and the percentage of normal morphology was statically not significant at a p value of $.05$ ($p > 0.05$).

Table 1: BSA of rats with induced hyperprolactinaemia and hypoprolactinaemia against the control group

Semen parameter	Control group	Hypoprolactinemic Group G2	Hyperprolactinemic group			
			G3	G4	G5	G6
% with progressive mortality	5	1.75	1	0	0	5.5
% with non- progressive mortality	46.75	28.75	27.75	12	7.5	45.5
% of motile forms	51.75	30.5	28.75	12	7.5	51
% with normal morphology	75.75	59	56.25	42	38.5	72
% with head abnormalities	11.75	19.25	24.25	28.5	25.5	10.75
% with tail abnormalities	13.5	20.75	24.5	29.5	36	11
Cells per field after dilution (x200)	105.63	86.75	72	11.05	16	103.43
Concentration (millions/ml)	18.29	16.33	12.96	5.79	2.88	17.42

IV. DISCUSSION

Oral bromocriptine induce a state of hypoprolactinaemia and oral largetil and subcutaneous fluphenazine induce a state of hyperprolactinaemia. The hyperprolactinaemia appear to be affected by the dose of fluphenazine administered as serum PRL attained being higher with high doses of fluphenazine and vice versa. The differences between serum PRL concentrations of the rats in G3, G4 and G5 as compared to the control group are highly significant by student t-test ($p < 0.001$). The percentage of progressive mortality of sperms is low in all the test groups with compared to the controls. The groups treated with fluphenazine exhibits zero progressive mortality while in control group shows a better result with a mean value of 5 ± 3.6514 (SD). This is due to the fact that the sperms in distal cauda usually are in quiescence under physiological states and known to acquire total motility only on ejaculation.

The percentage of non-progressive mortality of sperms is lowest in the test groups with induced hyperprolactinaemia with high and low doses of fluphenazine with a mean value of 12 ± 5.6569 (SD) and 7.5 ± 3.5355 (SD) respectively. The percentage of sperms with abnormal morphology is highest with the group which administered fluphenazine and lowest in the control group with a mean value with 75.75 ± 8.0984 (SD).

The rats which were given different doses of fluphenazine showed the lowest counts per field with mean values of 11.05 ± 2.4749 (SD) and 16 ± 8.4853 (SD) respectively whereas the highest figures of 72 ± 15.6684 were seen with the control group.

The total concentration is lowest with a mean value of 5.798 ± 4.9533 (SD) in the rats with induced hyperprolactinaemia whereas rats with hypoprolactinaemia showed much better concentrations with a mean of 16.335 ± 3.9936 (SD). The concentration in the control group had a mean value of 18.2965 ± 2.0376 (SD). The above results show that the level of serum PRL has an effect on the sperm parameters of the rats in a PRL level dependent manner. Mortality, morphology, cell counts per field and the concentration of sperms seems to affect more markedly when serum PRL is high. The most adverse results were seen in the group treated with high doses of fluphenazine than those who treated with lower dose of the same drug.

V. CONCLUSIONS

The level of semen PRL in white male rats has an effect on semen parameters. The extent of the effect is proportionate to the level of serum PRL. It is clearly evident that mortality, morphology, cell counts per field and the concentration of sperms are affected by the PRL. Thus abnormal PRL levels appear to exert an effect on spermatogenetic cycle.

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