Radiographical evaluation of the effect of parathyroid hormone on developing bone of embryos rat

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Abstract

Parathyroid hormones are playing an important role in maintaining calcium ion level in blood.

The present study was design to evaluate the effect of parathyroid hormone is on bone in developing embryos.

Ten albino pregnant rats were used in this study who 0.5 mg of parathyroid hormone as a tablets was given in drinking water from first day of gestation till delivery day (21).

Treated embryos (No.50) of one day old were evaluated in comparison to control (No.50) radiographically and by measuring weight and size of the head.

The results showed significant variation with low bone density in treated embryos.

The study showed that parathyroid hormone can effect in the metabolism and in development of bone.

Introduction

Parathyroid hormone is produced by Chief cells of the parathyroid glands. It helps to maintain the proper extra cellular fluid concentration of calcium ions (8.5 – 10.5 mg/100mL) (1, 2). This hormone acts on cells of the bones, kidneys and indirectly on the intestines leading to an increase in calcium ion concentration in body fluid.

In bone, parathyroid hormone binds to receptors on osteoblasts, signaling the cells to increase their secretion of osteoclast stimulating factor. This factor induces activation of these cells, thereby increasing bone resorption and the ultimate release of calcium ions into the blood (3).

Data demonstrated direct commitment of human embryonic stem cells to the osteogenic lineage. It has shown that embryonic cells respond to factors that affected osteogenesis including parathyroid hormone, osteocalcin, bone sialoprotein and collagen I (4).

The aim of this study is:

To examine effects of parathyroid hormone on rat embryo development, supported by radiogrphical examination

Materials and Methods

Ten albino pregnant rats were used in this study. Parathyroid hormone (0.5 mg) used in drinking water of pregnant rats from one day till the delivery (21 days). Fifty Embryos of one day old treated with parathyroid hormone were compared with (50) normal embryos of one day old by measuring weight, length, and head size.

Radiographical evaluation for osteogenesis (bone formation) of the head of embryos in both groups was illustrated.

For radiographical study objectives an images were made by using an optical bench to insure constant film placement beam geometry source – to – object and object – to – sensor distance a Pronix Planmincca CC where used, 65 Kv constant potential and five mA with spot size of 0.25 mm^2. the target to sensor distance was 23cm.

Density measurement were made digital monitor of the Pronix device in five separated regions, of each film by using and a perture setting of zoom, the density were recorded. Contrast was determined for each image by using ten – steps aluminum wedge were measured for contrast in two separated regions, and the difference between their mean was reported as a measurement of image contrast.

Results

The results show significant variation in measuring weight of neonatal rats (one day old) of treated and control groups.

The weight of control neonatal rats range from (25 – 30) mg while the weight of treated neonatal rats range from (13 – 18) mg.

Significant value of t-test was illustrated in table (1).

On measuring of neonatal length, rats from occipital prominence to the coccyx, shows significant differences between the control and treated groups. Figures (1, 2, 3), Table (2).

Results of head size from occipital prominence to the tip of the nose show for control groups range (20 – 22) mm and for treated group range (15.3 – 16) mm significant difference was illustrated in table (3). Figure (4).

Radiographical results show significant difference in radio opacity of bone of the head between central and treated neonatal rats (Figures 5, 6,7.8).

Table (4) shows there was a significant difference in the head bone contrast between controlled and treated groups since the step No. 6 of aluminum step wedg give normal appearance of bone contrast while the range of readings of treated group give range contrast of 4.1 ± 0.31.

Discussion

The observation of this study demonstrated that parathyroid hormone had osteogenic effect, as the data illustrated variation in length, weight and size of head measurement for the control and treated embryos.

The radiographic results which showed less radio opacity of the heads of the treated embryos rats in comparison to the control embryos indicated and gave evidence of the importance and the role of parathyroid hormone on metabolic bone interference which may be attributed to the effect of this hormone on embryonic osteogenic cells.

The findings of this study were in agreement with others (6, 7) who showed that parathyroid hormone is involved in the regulation of calcium metabolism via specific receptors in target organs principally bone and kidney.

Table (1): Weight mean (mg) variation in studied groups

Studied groups	No. of embryos	Weight (mg) (mean ± SD)	t-test p-value
Control	50	26.5 ± 0.33	< 0.005
Treated group	50	17.1 ± 0.45	

Table (2): Length (mm) difference of neonatal rats of studied groups.

Studied groups	No. of embryos	Length (mm) (mean ± SD)	t-test
Control	50	(39 – 41) range 39.8 ± 0.15	< 0.005
Treated	50	(31 – 33) range 32.1 ± 0.30	

Table (3): Comparison in head size (mm) in studied groups

Studied groups	No. of embryos	Head size (mm) Mean ± SD	t-test p value
Control	50	(20 – 22 mm) range 20.8 ± 0.4	< 0.001
Treated	50	(15.3 – 16 mm) range 15.7 ± 0.37	

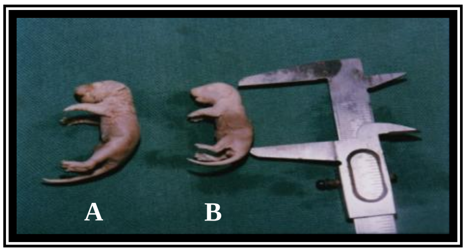

Fig.(1) Shows differences in the length of control (A) neonatal rat and the treated (B) one

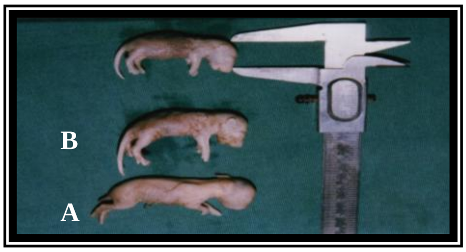

Fig.(2) Illustrated the measurement of head size

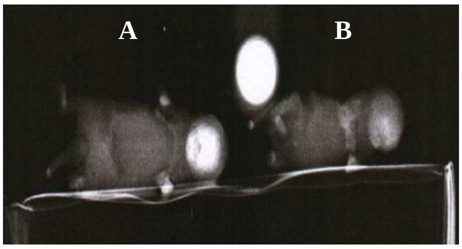

Fig.(.3) Shows differences in the bone density in the digital radiograghic figure of control neonatal (A) and treated (B) one, cephalic view
Exposure Values : 68 KV,5mA, 13.000s

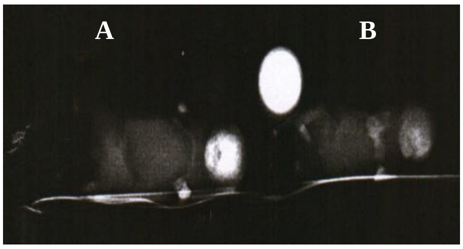

Fig.(.4) Shows differences in the bone contrast in the digital radiograghic figure of control neonatal (A) and treated (B) one, cephalic view
Exposure Values : 68 KV,5mA, 13.000s

Fig.(.5) Shows differences in the bone density in the digital radiograghic figure of control neonatal (A) and treated (B) one, lateral view .
Exposure Values : 68 KV,5mA, 13.000s

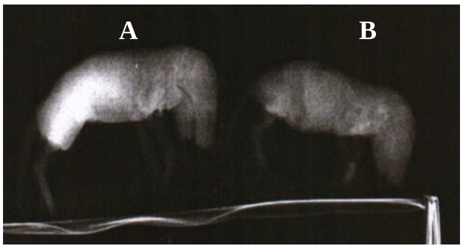

Fig.(.6) Shows differences in the bone contrast in the digital radiograghic figure of control neonatal (A) and treated (B) one, lateral view .
Exposure Values : 68 KV,5mA, 13.000s