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Editorial

Pituitary Marrow Connection-Evidence Based but Less Understood

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The interaction between pituitary hormone and bone marrow function is well documented. This is especially evident by hematological alteration in people with hyper or hypofunctioning pituitary, thyroid and adrenal disorders [1-3]. Table 1 summarizes the hematological alterations associated with changes in pituitary hormone levels. Pituitary gland has multiple effects on bone marrow through interaction of anterior pituitary hormones or unknown pituitary factors [4].

Pituitary gland has multiple effects on bone marrow through interaction of anterior pituitary hormones [4,5]. Anemia, leucopenia and thrombocytopenia in various combinations have been demonstrated in patients with hypopituitarism because of Sheehan's syndrome (hypopituitarism due to pituitary necrosis determined postpartum). In a case control study; hemoglobin, hematocrit, red cell, white cell and platelet count was found to be significantly decreased in patients with Sheehan's syndrome compared with age, gender, body mass index and parity matched healthy women. Anemia of normocytic/ normochromic type was seen in 87.20% of women with Sheehan's syndrome compared with 19.4% of controls [6]. Cause of anemia in these patients is because of deficiency of anterior pituitary hormones. Among anterior pituitary hormones, thyroid stimulating hormone (TSH), Adrenocorticotropic hormone (ACTH), prolactin (PRL) and growth hormone (GH) have direct or indirect effect on marrow function [7-9]. The effect of hormone replacement on hematological abnormalities has recently been demonstrated. Replacement of thyroxin & glucocorticoids in adequate doses to achieve euthyroid & eucortisol state results in complete recovery of anemia, leucopenia and thrombocytopenia [6].

Table 1: Summary of hematological changes secondary to alteration in anterior pituitary hormone levels.

Hormone state	Hematological effects
Growth hormone excess	Polycythemia
Growth hormone deficiency	Anemia- normocytic, normochromic
Cushing's syndrome	Polycythemia, neutrophilic leucocytosis
Adrenal insufficiency	polycythemia, eosinophilia
Hypogonadism	Anemia- normocytic, normochromic
Hyperprolactinemia	Anemia
Thyrotoxicosis	Polycythemia, macrocytosis, lymphocytosis
Hypothyroidism	Anemia- normocytic normochromic occasional macrocytosis

Anterior pituitary failure is also rarely associated with pancytopenia with hypocellular marrow [10-13]. Complete recovery of cytopenias and normalization of marrow function is observed after adequate replacement of thyroxin and glucocorticoids. Pituitary hormones are believed to have a direct regulatory effect on metabolic reactions involved in hematopoiesis [11]. Because anterior pituitary produces many hormones, individual contribution of hormone deficiencies and the response to specific replacement is a matter of debate. Hypophysectomised rats present with anemia, leucopenia and thrombocytopenia which is reversed after GH administration [7]. Growth hormone and Insulin like growth factor 1(IGF-1) have direct effects on erythroid and myeloid precursor cells and hemoglobin concentration increases after GH administration in adults [14]. Prolactin deficiency has no effect on hematopoiesis but hyperprolactinemia may be associated with anemia and improve after normalization with dopamine agonists [1]. Hypothyroidism is associated with anemia with preservation of white cells and platelet series [15]. Anemia is also associated with primary or secondary adrenal insufficiency. We previously documented that pancytopenia and hypocellular marrow associated with Sheehan's syndrome completely normalizes after 12 weeks of glucocorticoid (without thyroxin) replacement [16]. It is believed that corticosteroids directly stimulate erythropoiesis [17]. Progenitor cells have both erythropoietins as well as glucocorticoid receptors. There is a cross interaction between corticoid and erythropoietin receptors on addition of physiological dose of glucocorticoids. So the major factor in reversing the pancytopenia associated with hypopituitarism is glucocorticoid replacement.

Summary

Abnormalities in pituitary function are associated with hematological alterations like anemia, leucopenia, and thrombocytopenia in various combinations. Replacement of thyroxin and glucocorticoids in adequate doses completely normalizes these abnormalities. Among thyroxin and glucocorticoids, latter may be more important in reversing hematological abnormalities.

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