Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15492
DOI URL: http://dx.doi.org/10.21474/IJAR01/15492

RESEARCH ARTICLE

POLYCYTHEMIAWITH HYDRONEPHROSIS:A RARE CASE

Dr. Ravindra Shinde, Dr. Dibyendu Majumder and Dr. V. Pawar

Manuscript Info

Manuscript History
Received: 10 August 2022
Final Accepted: 14 September 2022
Published: October 2022

Abstract

Secondary polycythaemia results from increased Erythropoietin production which acts on normal erythropoietic progenitors leading to erythrocytosis. This report is about a 64 years old hypertensive and anaemic male who presented with complaints of painful per rectal bleeding with dribbling micturition. On undergoing relevant investigations, he was found to be anaemic with low haemoglobin and haematocrit. Lateron, subsequent follow up visits he was incidentally detected to be polycythemic. On further investigations for the same, he got diagnosed with urinary bladder outlet obstruction, atonic bladder with ureteric narrowing and left hydronephrosis with elevated erythropoietin levels. On treatment, his Haemoglobin count, haematocrit and Erythropoietin levels came back to normal.Unexplained polycythaemia should be thoroughly investigated to rule out renal pathology.

Introduction:-

True polycythaemia is a clinical entity with innate abnormalities in hemopoietic stem cells leading to remarkable functional disturbances in hemopoietic tissues with overproduction of RBCs, associated with low production of Erythropoietin[1]. There is abnormal increase in red cell mass with Hb>16.5gm% in men and Hb>16.0 gm% in women withhaematocrit values >52% in men and >48% in women[1,2]. It is also called as polycythaemiavera. Secondarypolycythaemia is erythrocytosis associated with pathologic conditions likeCoronary Heart Diseases(CHD),low atmospheric O2 pressure, Atrio-Ventricular(A-V)malformations,Chronic Obstructive Pulmonary Diseases (COPD),obesity and intoxication with certain chemicals.[1,2,3,4]These conditions lead to increased Erythropoietinproduction, that acts on normal erythropoiesis to overproduce RBCs.This secondary polycythaemia is also closely associated with renal and extrarenal neoplasms with certain intracranial tumours,uterine leiomyoma and Renal cell Carcinoma.[5]Forsell first suggested the association of Renal Cell Carcinoma and polycythaemia and reported 04 cases.[6]Later many studies have reported the association of secondary polycythaemia with non-neoplastic renal diseases like renal cysts, polycystic kidneys and unilateral or bilateral hydronephrosis.[5]Normally, Red Blood cell production is controlled by erythropoietin, a hormone which is synthesized mainly in the peritubular fibroblasts of the renal cortex.[4,5,7]It maintains constanthaemoglobin concentration under physiologicalconditions. In all the renal causes of secondary polycythaemia, distension of the pelvi-calyceal system or renal tissue and compression of the renal parenchyma is a constant feature.

Case History:

A64-year-old non-smoker, non-obese, non-diabetic, hypertensivemale, with no history of sleep apnoea came to the surgery OPD with complaints of dribbling micturition Hewas suffering from haemorrhoids, as well,for last fewyears,with intermittent pain and per rectalbleeding. He noticed fatigue and lethargy. On investigations he was

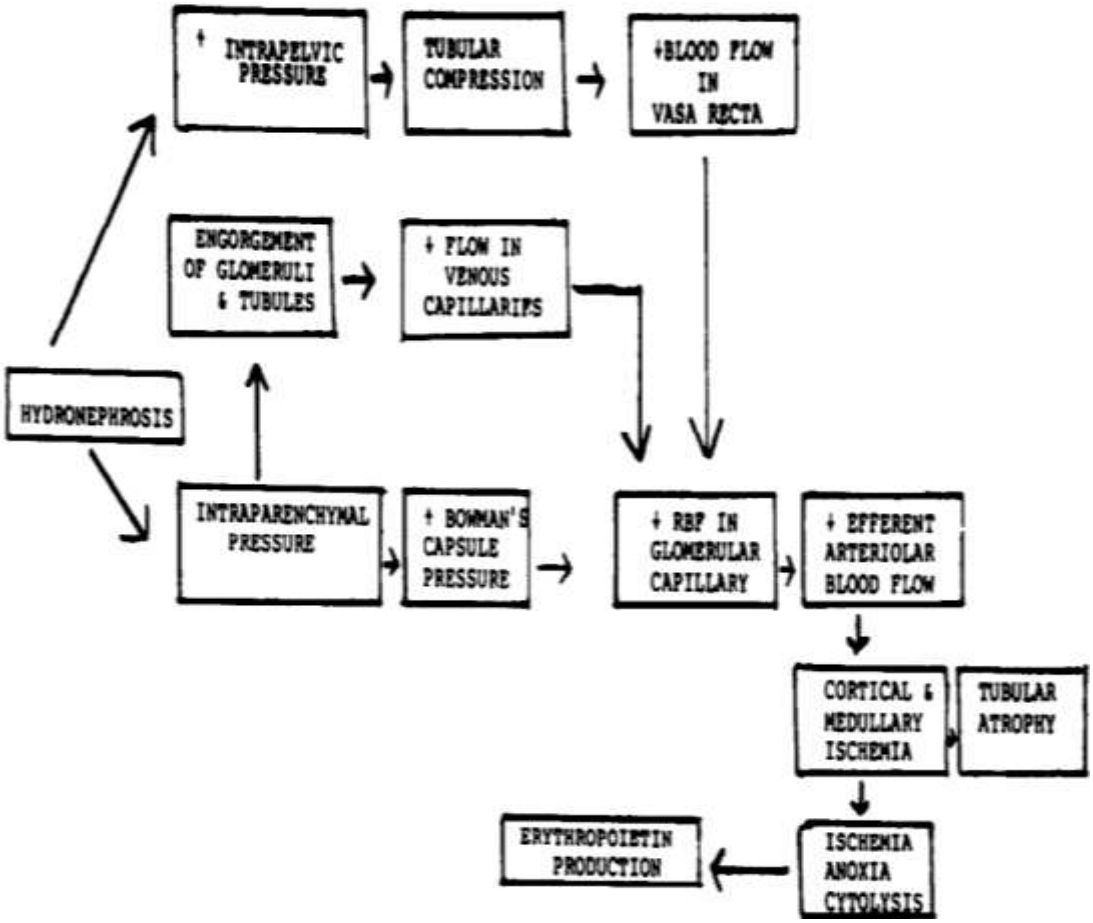
Corresponding Author:- Dr. Ravindra Shinde

anaemic with haemoglobinlevel of 8.6 gm/dl with haematocrit of 26.7%. The haemoglobin, red blood cellindicesand serum iron studieswere indicative of anaemia of chronic blood loss. He was on haematinics off and on. Few months later, in the follow-up studies, his Complete Blood Count wasrepeatedand his haemoglobin was unbelievably 20.6gm/dl with haematocrit value of 60.6%, Red blood cell count was 6.5 million/cu.mm. His leucocyte and platelet counts were normal. Mean Corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH), Mean corpuscular haemoglobinconcentration (MCHC) were within normal limits. His subsequent follow up studies showed haemoglobinas 20.4 gm/dl with red blood cell count 6.2million/cu.mm and haematocrit 60.3%. His X-Ray chest showed normal findings with no evidence of Chronic obstructive pulmonary disease. In view of consistent polycythaemia his erythropoietin (EPO) was checked, which showed marked elevation around 36.4 mIU/ml.Routineabdomino-pelvic Ultrasonography revealed prostatomegaly, prostate weighing 80 grams. There was bladder outlet obstruction with 400ml of post void residual urine volume. His Prostate Specific Antigen (PSA) level was within normalrange (2.8 ng/ml). The urinary bladder wall was thickened, atonic, with bilateral ureteric constrictionsat the cystoureteric junction. Left kidney showed hydronephrosis. There was no evidence of any mass lesion in the urinary bladder. The right kidney was normal. The renal function tests, serumelectrolytes, uric acid and liver function testswerewithinnormal range. Routine urine evaluation showed mild urinary tract infection. Intravenous Pyelography was done to evaluate the functioning of left kidney and fortunately the Intravenous pyelographyshowed delayed but complete clearing of the dye, suggesting normal functioning left kidney. The clinical diagnosis was given as urinary bladder outlet obstruction due to prostatomegaly with atonic bladder and bilateral ureteric strictures with left hydroureter andhydronephrosis. Trans urethral resection of prostatewas planned and he underwent further investigations like ECG, which showed sinus bradycardia. He was advised 2D Echocardiography which revealed Left ventricular hypertrophy and LV dysfunction with Ejection Fraction of 45%. In spiteof being on antihypertensive drugs he hadpersistent diastolic hypertension. His blood pressure was 140/110 mm Hg. HeunderwentTURP for relieving bladder outlet obstruction. To treat bilateral ureteric strictures and hydronephrosis of left kidney, bilateral stenting of ureters was performed. Histopathological findings of TURP specimenwas Benign Nodular hyperplasia of prostate. After 4 weeks, his routine investigations were done, which showed 16.2gm/dlhaemoglobin, with normal red blood cell count and indicesand normal Erythropoietin level (18.6 IU/L**).** Follow up Complete blood count and Erythropoietin were within normal limits even after 6 months. Left hydroureter and hydronephrosis also got resolved.

The above findings are indicative ofsecondary polycythaemia (Erythrocytosis) due to hydronephrotickidney.

Discussion:-

Since 1921, literature is being published indicating the connection of renal diseases and polycythemia[1]. Neoplastic lesions of kidney do present with erythrocytosis was also known later but the association of hydronephrosis and polycythaemia was suggested first time in 1957.The diagnosis of polycythaemia was established by repeated CBC and blood volume determination. The patient was treated by venesection and nephrectomy and it was noted that the blood counts dropped to normal and remained so till further 6 years of follow up.[8]Later in 1963 it was put forth that compression of renal parenchyma could be the stimulus for excess Erythropoietin secretion.[7]The mechanism of the concept of pressure stimulation ofrenal tissue to stimulate excess Erythropoietin is as given below: -

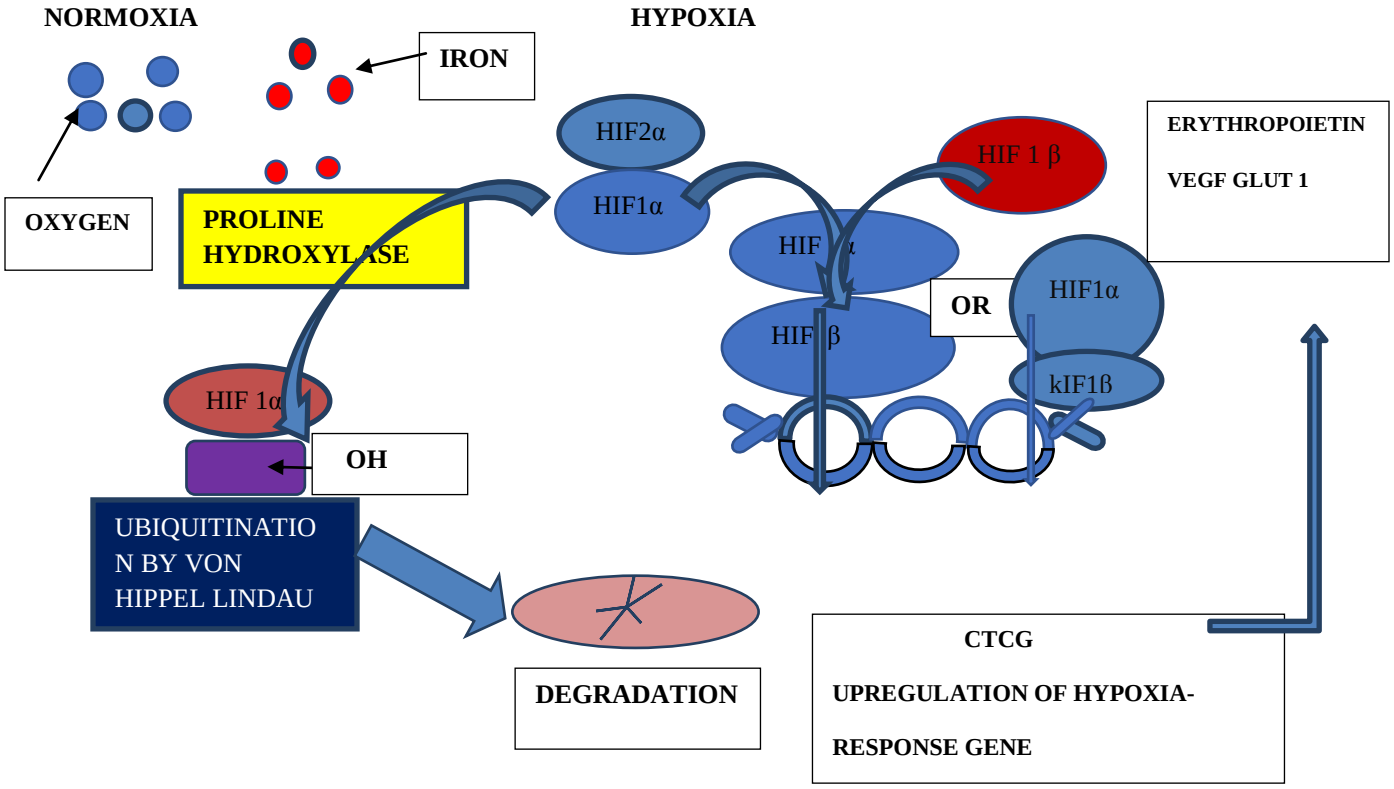


Erythropoietin binds to erythropoietin receptors on erythroid precursors and stimulate erythropoiesis.[3,8]

Major site for EPO production is kidney. Numerous compensatory mechanisms are activated in kidneys as a response to chronic hypoxia. Hypoxia inducible factor-1(HIF-1) is produced as aresult of hypoxic stimulation. It is a major factor responsible for transcriptional activation of EPO gene. It consists of HIF-1α and HIF-1β. The levels of HIF-1α increase tremendously as the oxygen concentration decreases and the levels decay rapidly with normoxia. The targeting and subsequent polyubiquitination of HIF-1αrequire VHL protein, oxygen and PHD (proline hydroxylase enzyme). With hypoxia, there is decrease in hydroxylation of HIF-1,when HIF-1α no longer binds to VHL. It thus gets accumulated and leads to increased production of EPO. It stabilizes and dimerizes with HIF-1β and activates transcription of target genes. Due to hypoxia HIF-2α dimerizes with HIF-1β and activates transcription of set of target genes that overlap with target genes regulated by HIF-1α/HIF -1β.[2]

Relationship Between Hypoxia Sensing and Erythropoietin Production.[2]

Figure:-Schematic Representation of the Relationship Between Hypoxia Sensing and Erythropoietin Production.[2]



The above mechanism holds good in association with increased hypoxia induced transcription factors (HIF) and consequent high erythropoietin level in other instances of tissue hypoxia resulting from COPD, CHD, intoxication of blood with tobacco smoke and carbon monoxide, renal artery stenosis and cystic diseases of kidney.[4]

In this case,patient was found to be anaemic initially, and on subsequent investigations was incidentally found to have polycythaemia with bladder outlet obstruction and hydronephrosis. Here hydronephrosis led to renal ischemia and thus resulted in polycythaemia due to excess stimulation of erythropoietin. Thefindings of polycythaemia were noticed relatively earlier which led to thorough investigations of our patient and saved his kidneys.

Conclusion:-

Unexplained polycythaemia should be thoroughly investigated to rule out any renal pathology.In patients of benign renal diseases with bladder outlet obstruction, timely surgical interventions would help to relieve the associated polycythaemia. Moreover, with long term follow up of patients, search for the causes other than HIF upregulation is required.

Bibliography:-

1) B.B Vincent, Leon Herman M.D Pseudo-polycythemia: extraordinary blood changes in a patient with renal calculus. Annals of Surgery. 1921 Oct 223-26
2)Hematology Basic Principles and practice 7th edition, Thepolycythemias.998-99.
3) Katiyar V, Aijaz T, Lingamaneni P, Vohra I, Cisak K. Polycythemia in a Patient with Atonic Bladder and Hydronephrosis. Cureus. 2021 Sep 19;13(9).
4)Wintrobes Clinical hematology volume one 12th edition.John P Greer .1016-18

5) Jaworski ZF, Wolan CT. Hydronephrosis and polycythemia: a case of erythrocytosis relieved by decompression of unilateral hydronephrosis and cured by nephrectomy. The American Journal of Medicine. 1963 Apr 1;34(4):523-34.
6)JelkmannW . Physiology and pharmacology of erythropoietin.Transfusion Medicine and Hemotherapy. 2013;40(5):302-9.
7) Hirsch I, Leiter E. Hydronephrosis and polycythemia. Urology. 1983 Apr 1;21(4):345-50.
8) COOPER WM, TUTTLE WB. Polycythemia associated with a benign kidney lesion: report of a case of erythrocytosis with hydronephrosis, with remission of polycythemia following nephrectomy. Annals of Internal Medicine. 1957 Nov 1;47(5):1008-15.