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Case Report

Posterior Reversible Encephalopathy Syndrome (PRES) and its relation with COPD

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ABSTRACT

Introduction: and importance: PRES is a neurological disorder which is usually seen in adult females with symptoms like headache, altered mental status, seizures, impairment of vision. It is a radiographic diagnosis and can present with complications like status epilepticus, hemorrhagic and ischemic brain strokes.It can be associated with many clinical entities, COPD being one. Treatment is symptomatic.

Case presentation: We present a case of a 68 years female, presenting with clinical pictures of PRES in an episode of Acute Exacerbation of COPD, who has been diagnosed with PRES based on her CT head and MRI head findings. Treated by treating the infection and other symptomatic measures.

Clinical discussion: Our case had similar association with COPD as mentioned in few other articles.

Conclusion: Although rare, PRES is sometimes associated with exacerbation of COPD, and thus should not be ignored.

1. Background

PRES is a neurological disorder, first described by Hinchey [1] in 1996, seen in 4 years–90 years of age predominantly young adult females clinically manifesting as headache, impairment of vision, altered mental status, seizures, along with prolonged coma; associated with hypertension, preeclampsia, eclampsia, post-transplantation and/or autoimmune diseases [2] and diagnosed by clinical symptoms and radiological features [3]. However, radiographic lesions in PRES are seldom seen in the "posterior" parieto-occipital white matter but usually involve the brain cortex, frontal lobes, basal ganglia, including the brainstem despite the name of the syndrome [4,5].

Although the definition mentions that PRES is reversible; secondary complications, as status epilepticus, intracranial hemorrhage (ICH), and huge ischemic infarction, can cause considerable morbidity and mortality [6–9].

Pathophysiology: Idiopathic, but various hypotheses(2,10–17) have been put forward which includes:

i) Brain self-regulation due to edema of the vessels [2,11]. Abrupt increase in arterial blood pressure leading to a hypertensive crisis observed in the majority of patients at the onset of PRES. Increased blood pressure above the upper limit of autoregulation leads to cerebral hyperperfusion leading to vascular leakage and vasogenic edema which can cause mass effect in brain [12–14].
ii) Cerebral vasoconstriction which leads to ischemia and later infarction [2,11]. Cerebrovascular autoregulation aims to maintain continuous cerebral blood flow (CBF) which is not dependent of blood pressure fluctuations, which is provided by cerebral artery vasodilation during episodes of hypotension. However, during periods of hypertension, this leads to cerebral vasoconstriction. The "hyperperfusion theory" is supported by the observation of elevated or fluctuating blood pressure, in majority of the patients [10,12].
iii) Destruction of the blood-brain barrier due to damage to endothelial cells causing exposure of fluids and proteins [2,11]. PRES is commonly observed in patients with preeclampsia and sepsis,

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also during treatment with immunosuppressive or cytotoxic agents which damages the endothelial cells. A common factor in these conditions is the presence of endogenous (pre-eclampsia, sepsis) or exogenous (chemotherapy, immunosuppressant) toxins that cause dysfunction of the endothelium [15–17].

Association with other diseases: Posterior Reversible occipital encephalopathy syndrome (PRES) has its associated with many other diseases, including inflammatory, neoplastic, with failure of organs. Chronic obstructive pulmonary disease (COPD) is a predisposing factor in many of these cases. Increased levels of TNF-α, IL-1 and endothelin-1 (ET-1) in blood are considered as the important mediators of this association. Increased levels of circulating tumor necrosis factor-α (TNFα), endothelin-1 (ET-1) interleukin-1 (IL-1) in COPD cause endothelial dysfunction in cerebral arteries. Infection during COPD exacerbations increases the level of IL-1, ET-1 and TNFα which may be the most likely pathophysiology behind the development of PRES during COPD exacerbations [18,19].

In a study, Aaslid et al. [20] had demonstrated for the first time that cerebral autoregulation is increased or decreased by hypocapnia or hypercapnia, respectively. In other words, there is an interaction among the respiratory regulatory system and cerebral blood flow, which is dependent upon changes in CO2 concentration in blood [21]. Thus, hypercapnia and metabolic acidosis caused by COPD(21) causes cerebral hyperperfusion and hence vascular leakage leading to edema, leading to mass effect in brain [12–14].

Clinical findings: Patients may exhibit signs of encephalopathy, which includes quantitative and qualitative reduction in consciousness which further consists of cognitive impairment, drowsiness or coma. Localized and systemic epileptic seizures are usually seen in about 2/3 of all patients. Seizures can lead to status epilepticus in 3–13% of cases which is one of the life-threatening complications of PRES. Due to the frequent involvement of the occipital lobe, impairment of vision such as decreased vision, visual field abnormalities including hemianopia, cortical blindness or visual hallucinations is found in almost 2/3 of all PRES patients. Less frequent neurological symptoms include headache, nausea, vomiting, and abnormal consciousness [1,4,11,12,22–25].

Diagnosis: Fugate et al. [26] suggested the following criteria for the diagnosis of PRES: i) acute onset of neurological symptoms; ii) (focal) angiogenic edema in neuroimaging and; iii) reversible findings clinically and/or radiologically.

Investigations: CT scans usually show angiogenic edema distributed in both hemispheres. MRI is highly sensitive which shows high intensity lesions in T2-emphasized or FLAIR (Fluid Attenuated Inversion Recovery) sequences [11]. PRES can be diagnosed when brain images (mostly MRI) show characteristic features in relevant clinical scenarios-usually with seizures and encephalopathy, often with vision loss (this vision loss is mainly cortical function). It has not yet been confirmed whether it is because of injury or retinal ischemia). Extensive T2/FLAIR hyperintensity is seen on MRI, usually in the posterior region [1]. MRI lesions which reflect angiogenic edema usually follow a parieto-occipital spectrum [16]. Because of the low density of white matter, the subcortical area is often affected. However, the involvement of the cortex is also mentioned [11]. Parieto-occipital distribution is seen in about 70% of all cases, but frontal sulcus or watershed patterns are usually seen [5]. Lesions in other regions such as the cerebellum, basal ganglia, brain stem, and spinal cord are less common [25].

Treatment: Removal of triggering factors like infections, toxins, steroids and treatment of COPD, hypertensive urgency/emergency seem to enhance the full recovery of PRES within a period of days to weeks in most of the cases. But, radiological reversal is delayed than clinical recovery [4,27]. Management is symptomatic, which includes keeping blood pressure under pressure preventing/treating hypertensive urgency or emergency [1,16,28–30]. Decrease in blood pressure by 25% from baseline is advised [31]. Anticonvulsant are used but dose and duration are yet not specified [16,24].

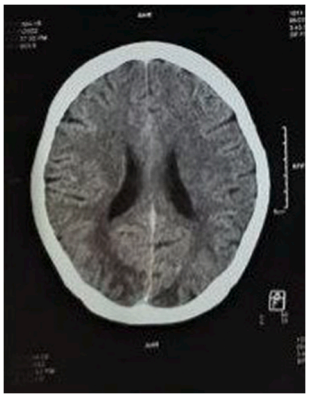

Fig. 1. CT head.

This work has been completed in line with the SCARE criteria [32].

2. Case presentation

We present a case of 68 years old female who presented to a tertiary level hospital of Nepal.

Clinical findings: Her chief complaint was 3 episodes of abnormal body movements since the last 1 month, last episode at our Emergency Department.

On physical examination, there was B/L pitting edema, labored breathing with SpO 2 70% in RA, Respiratory Rate 22 breaths per minute. On auscultation, there was B/L decreased air entry, abdomen was soft, non-tender. GCS was 15/15, power was 3/5 in all the four limbs, and bilateral pupils were round and reactive.

Timeline: During first episode i.e. 1 month back, there is history of LOC, stiffness of the body, up rolling of the eyes. According to the informant, she fainted in the bus while travelling. There is H/O bluish discoloration of all the limbs. No H/O frothing from the mouth, tongue bite, stool and urinary incontinence. She gained consciousness after being resuscitated with IV fluid in a hospital in her hometown. CT head was performed. She was admitted in the ICU for raised PCO2 for which she was on intermittent BiPAP overnight. She was managed conservatively and was discharged.

1 week ago, patient complained of headache, frontal, dull aching type, after which she complained of blurring of vision. Then she had abnormal body movement (tonic type of seizure), with up rolling of the eyes, for about 1 minute. There is no H/O frothing from the mouth, tongue bite, urinary and stool incontinence. There is H/O slurring of speech and was not able to recognize her relatives. She was taken to the nearby hospital.

Then she was referred to our setup for further workup. She had 1 episode of abnormal body movement while in our center. Patient also had vomiting, 2 episodes, and while at ER, which was projectile in nature, non-bilious, non-blood stained, containing food particles. There is H/O headache, dull aching, mild, in the frontal region, continuous in nature. It was associated with blurring of vision. There is history of fever, maximum temperature recorded was 104′F and was not associated with chills and rigor.

She is a known case of Chronic Obstructive Pulmonary Disease (COPD) with cor pulmonale with polycythemia for which she had undergone phlebotomy. She is taking Inhaler Salbutamol, Inhaler Foracort for her condition. There is no family history of similar illness along with Diabetes, COPD, and Hypertension.

Diagnostic Procedures: Hematological tests and urinalysis was performed, which came out to be normal with sterile urine culture. Arterial blood gas on presentation showed pH 7.373 with P_{CO2} 54.3 mm of Hg, P_{O2} 89 mm of Hg at 8L of O2. Later at time of discharge, P_{CO2} decreased to 37.8 mm of Hg and P_{O2} 52 mm of Hg with blood pH 7.42 at room air.

CT scan of head (Fig. 1) showed Ill-defined symmetrical hypodensity

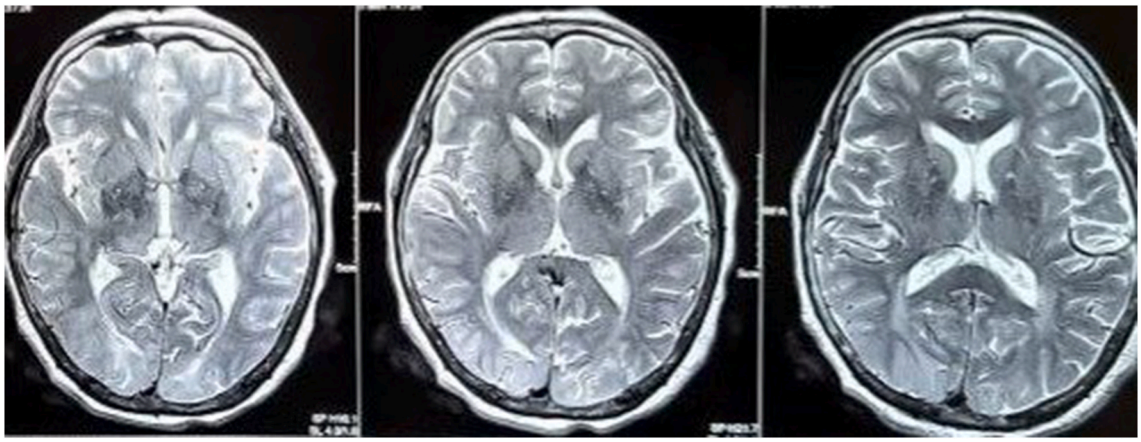

Fig. 2. MRI head.

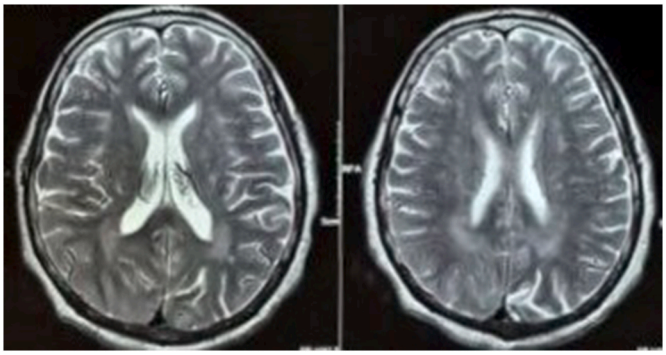

Fig. 3. MRI head.

in bilateral occipital lobe. MRI (Figs. 2 and 3) was obtained to further define the lesion, confirming mild altered signal intensity in bilateral parietal, occipital lobe, right temporal lobe involving both grey and white matter with restriction of diffusion and effacement of adjacent sulci suggesting Posterior Reversible Encephalopathy Syndrome (PRES).

Interventions: The patient was managed conservatively with antibiotics, seizure prophylaxis and aspirin. Chest Physiotherapy was started. Patient was discharged a week after admission.

Outcome: Follow up after a week revealed the patient being symptomatically better.

3. Discussion

As per Legriel et al. [2], our patient is an adult female presenting with symptoms of PRES. Our patient had headache, vomiting, blurring of vision, alterered mental status and seizures. PRES pathology includes vasogenic edema causing mass effect and decrease in cerebral blood flow leading to infarction [10,12–14]. The lab findings of our patient showed that the patient had been in metabolic acidosis which might have accentuated the situation due to increased cerebral blood flow causing vasogenic edema as mentioned in other studies [12–14]. Consistent with these hypotheses, CT findings of our patient showed features relevant to PRES as mentioned above in case presentation. However, the radiological signs of edema seemed to affect not only the occipital lobes but also the parietal and temporal loves which signifies PRES as a misnomer as reported by various studies [4,5].

Location of lesions seen on Neuroimaging	Incidence [12]
Frontal and Temporal lobe	75%
Basal ganglia and brainstem	33.33%
Cerebellum	50%

Intracranial hemorrhage is present in 25% of cases. Intraparenchymal being the most common and sulcal subarachnoid hemorrhage being the second most common [12].

Also, there has been coexistence of COPD and PRES in our patient which has also been reported by some other studies as ‘a rare association’ [18,19]. Antibiotics was given as it was thought to be an infective exacerbation of COPD and other symptomatic management was done which has also been mentioned as the accepted treatment of PRES in other articles [4,6,24,27].

4. Conclusion

Coming to the conclusion, the term ‘PRES’ is a misnomer and the association of COPD with PRES is not a common entity, but the differential diagnosis as PRES should be kept in the mind whenever there is presence of encephalopathy or seizure in the patients undergoing exacerbation of COPD.

Patient perspective

The patient was not aware of his health condition before he visited our Centre. The patient was glad to be diagnosed and was somehow satisfied by the treatment.

Statement of ethics

Ethical approval was not needed for this study according to local/national guidelines. Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

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Author contributions

Upasana Bhatta, Salina Neupane, Suprava Amatya brought the idea of this study. Upasana Bhatta and Aavishkar Raj Regmi wrote the manuscript. Aditya Kumar Verma, Sarmendra Mishra worked for the collection of data. Aavishkar Raj Regmi, Adarsh Gurung and Basanta Rijal reviewed and re-edited the manuscript. Aavishkar Raj Regmi, Upasana Bhatta and Aakankshya Regmi worked up together for the publication.

Data availability STATEMENT

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

Guarantor

Aavishkar Raj Regmi accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

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Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Declaration of competing interest

The authors have no any conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2022.104877.

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