Correspondence

Basal Ganglia Calcification with Hypomagnesemia

Sir,

Primary hypoparathyroidism or pseudohypoparathyroidism is known to cause basal ganglia calcification, but functional hypoparathyroidism from hypomagnesemia causing basal ganglia calcification is not reported till now (Table 1). We report a case of basal ganglia calcification having hypocalcemia and functional hypoparathyroidism secondary to hypomagnesemia.

A 65 years old male retired military person presented with recurrent episodes of carpopedal spasm, stridor, and dysphonia during last one year. He had forgetfulness and poverty of motion for the same duration. Difficulty of movement was noticed from initiation and persisted throughout the motion and also during turning back. He had poor food intake during last one year with caloric deprivation. He was a chronic alcoholic but left alcohol intake recently. He was hypertensive and was on irregular medication. He was not a known diabetic and had no history suggestive of any coronary artery disease, renal or liver disease.

Eight years ago, he had an episode of weakness on right side of body along with slurring of speech and ipsilateral deviation of angle of mouth. Family history was nonsignificant. He had mild pallor. Build was average and nutrition was subnormal. BP was 160/90 mm Hg. He was alert and oriented to person but not to time or place. He had poverty of ideas with loss of recent and past memory. He had lost the reasoning and problem solving capability and arithmetic ability. He was able to read but unable to write properly. His score of mini-mental status examination (MMSE) was 14/30. Cranium, spine and cranial nerves were within normal limit. He had static tremor and cogwheel rigidity.

Table 1: Showing various causes of basal ganglia calcification

1. Physiological (ageing),
2. Familial idiopathic cerebral calcification (Fahr’s syndrome),
3. Hypoparathyroidism,
4. Pseudohypoparathyroidism,
5. Secondary hyperparathyroidism,
6. Congenital infections (for example, toxoplasmosis),
7. Mitochondrial cytopathies,
8. Wilson’s disease,
9. Birth anoxia,
10. Carbon monoxide intoxication,
11. Lead poisoning,
12. Tuberous sclerosis,
13. Cockayne’s syndrome,
14. Acquired immunodeficiency syndrome (especially in children),
15. Radiation therapy,
16. Methotrexate therapy,
17. Down syndrome.

Muscle power was 4/5 in all four limbs. Chorea, athetosis, hemiballismus and dystonia were absent. Deep tendon reflexes were exaggerated. Planter was equivocal bilaterally. No signs of cerebellar disease were apparent. Autonomic nervous system was normal. Gait was unsteady. No twitching was seen during tapping the course of facial nerve. Trousseau’s sign was positive (Figure 1). Other systems revealed no abnormality.

On laboratory investigation his serum calcium was 5.3 mg/dl (normal range 9.0-11.0 mg/dl) and phosphate was 7.6 mg/dL (normal range 3.0-5.0 mg/dL). Serum alkaline phosphatase was 71 U/L (normal range 30-120 U/L). Serum total protein was 6 mg/dl, albumin 2.9 mg/dl. Serum parathyroid hormone (PTH) level was low normal, 12.10 pg/ml (normal range 9.5-75 pg/ml for ages <70 years). Urinary excretion of calcium over 24 hours was 15 mg (normal range 100-321 mg/24 hrs). Serum magnesium was low, 1.03 mg/dl (normal 1.7-2.4 mg/dl). Repeated measurement of serum magnesium revealed low values (0.98 mg/dl and 1.07 mg/dl). Urinary excretion of magnesium was reduced to 20 mg/24 hr. Serum vitamin D3 (25-hydroxyvitamin D) level was normal (27 ng/mL). Serum vitamin B12 was 867.3 pg/ml (normal range 239-931 pg/ml). Serum parathyroid hormone (PTH) level was low normal, 1.03 µIU/ml (normal range 0.27-4.2 µIU/ml), free T3 4.16 pg/ml (normal range 2.0-4.4 pg/ml) and free T4 1.83 ng/dl (normal range 0.95-1.7 ng/dl). Osteoporosis was detected in x-ray of spine. Chest x-ray was normal. Ultrasonography of abdomen did not reveal any nephrolithiasis. CT scan of brain revealed multiple infarcts, bilateral basal ganglia and cerebellar (dentate nucleus) calcification (Figures 2 and 3). MRI of brain revealed generalised cerebral atrophic changes and multiple infarcts with ischaemic leukoariosis. Bilateral putaminal and caudate regions and cerebellum showed areas of hyperintensities in T2W images and hypointensities in T1W images suggestive of focal mineralization/calciﬁcation (Figures 4, 5). [Calcified areas in basal ganglia usually give low-intensity signals on T2-weighted images and low-or high-intensity signals on T1-weighted images. Reactive gliosis or degenerating tissue within the calcified areas may give rise to hyperintensities in both T1W and T2W images.]

ECG

Fig. 1: Showing carpal spasm after inflating sphygmomanometer cuff 20 mm above systolic BP for 3 minutes (Trousseau’s sign) in latent tetany.

Fig. 2: Showing CT scan of brain with basal ganglia calcification.

Fig. 3: Showing CT scan of brain with cerebellar calcification.
showed QTc prolongation (Figure 6). Echocardiography revealed diastolic dysfunction. Patient was treated with oral calcium and vitamin D supplementation, but that failed to improve his clinical picture. Magnesium supplementation was given later after getting the report of hypomagnesemia. Neuromuscular features and biochemical abnormalities responded to it.

Degenerative disease or Fahr’s disease are relatively common causes of basal ganglia calcification but in the reported case associated biochemical findings and cerebellar calcification dictate it’s possible relationship with hypomagnesemia and resultant hypocalcemia due to functional hypoparathyroidism. Hypomagnesemia is encountered in subjects with alcoholism, chronic caloric deprivation especially in elderly, intestinal malabsorption syndromes and genetic (like Bartter’s syndrome, Gitelman syndrome) or acquired renal magnesium wasting. 1 Magnesium depletion in alcoholism can result in part from nutritional deficiency of magnesium, overall caloric starvation and ketosis, gastrointestinal losses due to vomiting or diarrhea and magnesuric effect of alcohol ingestion. Caloric deprivation especially in intensive care unit can also lead to acute hypomagnesemia. Alcoholism and poor food intake due to old age and multi-infarct dementia were the possible causes of hypomagnesemia in our patient.

Hypocalcemia is a common consequence of hypomagnesemia. Hypomagnesemia also has similar neuromuscular features like hypocalcemia and vitamin D deficiency. Inappropriately normal or low serum PTH despite hypocalcemia is seen in hypomagnesemia. Hypomagnesemia inhibits PTH secretion, which is due to augmented signaling by calcium sensing receptor (CaSR)-associated G proteins (normally inhibited by magnesium) within the parathyroid cell due to intracellular magnesium (Mg²⁺) depletion. Hypomagnesemia may also impair PTH action on target cells in bone and kidney, although some have observed normal responsiveness. 2 Thus magnesium deficiency causes a functional form of hypoparathyroidism as well as resistance to PTH.

Basal ganglia calcification in hypomagnesemia is unknown. Lodha et al described only a case of renal magnesium wasting with nephrocalcinosis and basal ganglia calcification. 3 Chronic hypomagnesemia may be a cause of basal ganglia calcification through functional hypoparathyroidism and associated hypocalcemia.

Serum concentration of calcium, phosphorus, and PTH should be assessed in all individuals with calcification of basal ganglia to rule out hypoparathyroidism. If hypocalcemia is detected and it is refractory to calcium or vitamin D, then hypomagnesemia (and associated functional hypoparathyroidism) should be considered. Hypomagnesemia is often overlooked and mistreated with calcium or vitamin D, which are ineffective unless hypomagnesemia is corrected. Hypomagnesemia should be included as a rare cause of basal ganglia calcification. Larger case series are needed to establish the association strongly.

References

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Received: 16.09.2010; Revised: 26.10.2010; Accepted: 24.11.2010

Prognostic Value of Post-Prandial Triglyceride Level with Reference to Cardiac impairment in Well Controlled Type 2 Diabetic Population

Sir,

We read with interest the original article on “Post-Prandial Hypertriglyceridemia in Patients with Type 2 Diabetes Mellitus with and without Macrovascular Disease” by Kumar et al. 1 In routine practice plasma lipids are usually measured...
in fasting condition. But as we spend most part of our day in post-prandial state and several studies have already established role of postprandial lipids in early atherogenesis,\(^1,2\) estimating triglyceride level in post-prandial phase may be more valuable as a cardiac risk predictor in diabetics.

To determine the role of post-prandial hypertriglyceridemia in macrovascular complications of diabetes, we conducted a cross-sectional comparative study on eighty well controlled type 2 diabetic patients (age 38-73 years) attending Cardio-Diabetic clinic of IPGMER, Kolkata and the results were compared with eighty age, sex, Body-Mass Index matched non diabetic healthy controls. Both fasting triglyceride (FTg) and post-prandial triglyceride (PPTg), 4 hours following a standard test meal were measured and cardiac risk was assessed by Carotid Intima-Medial Thickness (CIMT) using B mode ultrasonography.

In our study mean FTg and PPTg levels in diabetics were significantly higher than non diabetics (p-value < 0.01). Good correlation was found between FTg and PPTg in both diabetics and non diabetics (Pearson r = 0.547 and 0.709 respectively). Mean CIMT in diabetics was 0.957mm (SD: ± 0.153) and 0.589mm (SD: ± 0.076) in non diabetics. Significant difference was found in CIMT between diabetics and non diabetics (p-value < 0.01). PPTg correlated well with CIMT in diabetics (Pearson r = 0.558, Figure 1) which indicates that, post-prandial hypertriglyceridemia can be used as a strong determinant of macrovascular risk in diabetics. Besides CIMT, cardiac risk was also determined by performing Electrocardiogram (ECG) and Treadmill Test (TMT) on study subjects. Mean PPTg was also found to be significantly high in ECG and TMT positive diabetic individuals (p-value < 0.01, Figure 2) which again supports, that high PPTg carries significant risk for coronary artery disease in well controlled diabetics.

In the study conducted by Kumar et al.,\(^1\) the authors have defined cardiac macrovascular complications on the basis of ECG, TMT and coronary angiogram. However we feel that such macrovascular risk has not been determined quantitatively and therefore its correlation with PPTg is also lacking in that study. Since atherosclerosis is a silent process many subjects in group II of the study (Diabetics without macrovascular complications) may have latent atherosclerosis as Diabetes mellitus itself is considered a Coronary artery disease risk-equivalent.\(^4\) So in our study we have used CIMT as a quantitative marker for early atherosclerosis and have established its direct correlation with PPTg. However without classifying our diabetic subjects in to any groups, we have determined role of raised PPTg level in contributing cardiac complications in all of them. Though some of the studies were done before to correlate PPTg level with CIMT,\(^5,6\) none of these studies had shown any significant relation of elevated post-prandial triglyceride level with ECG and TMT, two essential routine tests, conventionally done to predict coronary ischemia.

Therefore to conclude, in our clinical practice besides measuring fasting lipid profile, post-prandial lipid components especially triglyceride level should also be considered while determining early atherosclerotic or macrovascular complications in type 2 diabetic patients.

References


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Received: 24.12.2010; Accepted: 09.02.2011