

Diabetic nephropathy and retinopathy in a 15 years old child: a case report

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Abstract

Non communicable diseases like type 1 diabetes mellitus (DM) are increasing in children. Ten percent of diabetes are type 1. Diabetic nephropathy(DN) and diabetic retinopathy (DR) are the most common complications in DM .Diabetic nephropathy is characterized by persistent proteinuria leading to end stage renal disease .Around 25-45% of patient with type 1 diabetes will develop overt nephropathy over 10-15 years .Hence it is very rare to develop diabetic nephropathy and retinopathy after 2 years of arising symptom in the paediatric age group .In this case report we describe a 15 years old boy who was diagnosed to have type 1 DM 7 days back and symptoms of DM started 2 years back . Patient develop overt nephropathy manifested by edema and proteinuria and retinopathy manifested by dimness of vision, microaneurysm with dot and blot haemorrhage after 2 years of complaining symptoms suggestive of DM. The patient was managed accordingly with insulin therapy for tight glycaemic control and supportive therapy for chronic kidney disease (stage IV). As retinopathy preceed nephropathy, so renal biopsy was not done. It is recommended that all children should be screened for type 1 DM periodically to ensure good glycaemic control as well as reduce the complication like DR and DN.[J Shaheed Suhrawardy Med Coll, 2014;6(2):93-95]

Key Words: diabetic nephropathy, diabetic retinopathy, microalbuminuria, children

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Introduction

Type 1 diabetes mellitus (DM) is the most common metabolic disease in childhood¹. It is a chronic illness characterized by the body's inability to produce insulin due to autoimmune destruction of the beta cells in the pancreas². Incidence rate varies greatly between different countries, within countries and different ethnic population .The incidence of type 1DM increased worldwide in the closing decades of the 20thcentury. Steep rises in the age group under 5 years has been recorded recently. One of the main concerns of type 1 DM is the development of diabetic nephropathy³. It is characterized by progressive loss of kidney function and systemic disturbances including hypertension, proteinuria and the numerous sequelae of chronic renal insufficiency⁴. It can be defined by

microalbuminuria (MA)-urinary albumin excretion of 30-300mg/24 hrs or macroalbuminuria-urinary albumin excretion more than 300mg/24hrs and abnormal renal function as represented by an increase in serum creatinine and reduced Glomerular filtration rate (GFR), is one of the serious complication of diabetes as well as the leading cause of end stage renal disease (ESRD)⁵. Diabetic nephropathy is rare in adolescents and unusual in those who have who have been diagnosed for less than 5 years. However, microalbuminuria (incipient nephropathy) and even renal histologic changes can be found a relatively short while after diagnosis in some diabetes. It is not clear what determines the rate of progression from incipient to overt nephropathy but hypertension, glomerular filtration, hypercholesterolaemia and poor glycaemic control, genetic

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factor with family history of DM, racial (Asian, African American, hispanics) factor and male sex have been implicated⁶. There are reports of type 1 DM being more common in some parts of Europe like Finland, Italy, Sweden, Denmark and also female preponderance in some low risk populations like Japan¹. However, in this report, a boy was found to have the features of diabetic nephropathy and retinopathy within 2 yrs of onset of symptoms and at the 7th day of the diagnosis of type 1 DM.

Presentation

A 48 years old male patient attended the outpatient. The patient was a 15 years old boy who was admitted in paediatric nephrology department of Bangabandhu Sheikh Mujib Medical University (BSMMU) for evaluation of increased frequency and increased volume of urination, increased desire to drink and weight loss for last 2 years and headache and dimness of vision for last 10 days. He was diagnosed to have type 1 DM 7 days back and was treated by a general practitioner with short acting insulin. Family history was negative for DM and patient gave previous history of recurrent urinary tract infection and skin infection. Physical examination shows, ill looking toxic facies, moderate pallor, weight for age at 25th centile and height for age at below 3rd centile. Blood pressure measurement were between 50th and 90th centile for height and age, oral thrush and ankle oedema were present and bedside urine albumin (++) . Other physical examination reveals normal. Dilated ophthalmological evaluation was done which revealed microaneurysm and few dot and blot haemorrhages in retina. Initial work up showed, Hb% 8.8 gm/dl, Serum creatinine 5.4mg/dl, blood urea 131 mg/dl, HbA1c 8.3%, fasting plasma glucose 7.5mmol/L, 2hrs after plasma glucose 17.7 mmol/L, serum lipid profile-serum cholesterol 220 mg/dl, serum triglyceride 154 mg/dl, serum LDL 90mg/dl, serum HDL 40mg/dl, serum calcium 4.4 mg/dl, serum inorganic phosphate 6.1mg/dl, serum albumin 36 g/L, spot urinary microalbumin 55 mg/24 hrs, serum potassium 2.7mmol/L, Total carbon dioxide 11 mmol/L and estimated GFR (e-GFR) 18 ml/min/1.73 m² BSA. The patient was started on ACE inhibitor and importance of glycaemic control was discussed with parents and his insulin requirement was adjusted aiming at tight glycaemic control. Ophthalmologist was consulted for diabetic retinopathy.

Discussion

The patient was diagnosed to have both diabetic nephropathy (DN) leading to chronic kidney disease (stage-IV) and diabetic retinopathy. It is not very common to encounter overt diabetic nephropathy in the paediatric age group as renal involvement in diabetic nephropathy occurs in 5 stages that are related to duration of diseases which needs usually after 15-20 years⁶. The five stages of diabetic nephropathy are stage 1 which occurs with the onset of disease and characterized by enlarged kidneys and hyperfiltration with increased GFR; stage 2 occurs after 2-

5 years and similar to stage 1 except histopathological abnormalities can be found on renal biopsy; stage 3 is also termed as incipient DN which is characterized by microalbuminuria and normal renal function and with the onset of this stage hypertension develops and progressive decline of GFR at a rate of 3 to 4 ml/min/year occurs; stage 4 is also termed as overt DN and in this stage dipstick positive proteinuria and rapid decline in GFR occur; stage 5, stage of end stage renal disease (ESRD) where need for renal replacement therapy is reached usually within 10 years of stage 4. The earliest pathological change in diabetic nephropathy in stage 1 is increased renal size, in stage 2 is the thickening of glomerular basement membrane (GBM), in stage 3 is the thickening of GBM and expansion of the mesangium due to accumulation of extracellular matrix, in stage 4 marked renal abnormalities occurs involving blood vessels, focal and segmental interstitial fibrosis, in stage 5 advanced glomerulopathy occurs. Light microscopic change in diffuse diabetic nephropathy shows an increase in solid spaces of the tuft as coarse branching of solid material and large acellular accumulation observed in this area, these are known as the Kimmelstiel-wilson nodules or nodular glomerulosclerosis⁷. Diabetic retinopathy (DR) is one of the microvascular complication of DM which might be of same pathogenic pathways as DN. Retinopathy when it coexists with nephropathy (usually called renal-retinal syndrome), is thought to be a window of renal complication⁸⁻¹⁰. Diabetic retinopathy may serve as an indicator of DN. The relationship between DR and DN in type 1 DM has been demonstrated in some studies¹⁰. Review of literature has shown both prepubertal and pubertal duration of diabetes are relevant for the development of background retinopathy. It is highly unlikely for microalbuminuria to be present in the first 4 to 5 years of DM and thus it is recommended to start screening for MA after 5 years of onset of Type 1 DM. Once the stage of MA is reached progression of renal disease is the rule¹¹. This patient presented with polyuria, polydipsia, weight loss, headache and dimness of vision, microalbuminuria and impaired renal function with acidosis, eGFR was 18 ml/min/1.73m² BSA. Such presentation of overt nephropathy with Chronic kidney disease (CKD) so soon after the onset of DM is unusual¹². However, Quattrin et al¹³ showed incidence of incipient and overt nephropathy in adolescent DM may be greater than previously thought, although the minimum duration of disease was five years. Several studies suggest that without intervention 30-50% of patient of MA progress to overt nephropathy in 10-15 years¹⁴.

It is unclear why some individual develop diabetic nephropathy at an earlier stage than others, although a delayed diagnosis, poor patient compliance and reduced availability of test for microalbuminuria in primary health care level may be the likely explanation in this case⁶. Ethnic influence with high incidence of DN in Asian child and male sex are added risk factor of this boy¹⁵. Poor glycaemic control is a risk factor for developing renal

vascular disease. Tight glycaemic control in pre-albuminuric phase was shown to significantly prevent or at least reduce the incidence of MA, although it was unable to reduce the incidence of overt proteinuria in patient with type 1 DM and established proteinuria¹⁶. There are also other risk factors such as hypertension, hyperlipidaemia, smoking, genetic predisposition ethnicity and male sex in addition to poor glycaemic control. Another study suggested that adolescent and puberty are risk factors for progression of diabetic nephropathy¹⁷.

In this case, short duration of diabetes was an indication of renal biopsy for confirming the diagnosis but as diabetic retinopathy is present which precedes or concurs the occurrence of nephropathy renal biopsy was not mandatory⁷. In this case, tight glycaemic control was not achieved before. The patient had also risk factors including being male, Asian, pubertal spurt and adolescence which may be a partial explanation of rapid occurrence of overt nephropathy in a time that is considered very short when taking concern of the above pathogenic mechanisms.

Evidence also suggest that heavy proteinuria cannot be altered by good glycaemic control but reduction of hyperlipidaemia and the use of angiotensin converting enzyme (ACE) inhibitors with or without antireceptor blocker (ARB) to reduce blood pressure (BP) and proteinuria may diminish the rate of decline in renal function⁷. There is inverse correlation between albumin excretion and level of eGFR which is not much evident in this boy¹⁸. The child was anaemic but normotensive which was not consistent with study by Bayazit et al¹⁹ who reported BP is often raised in microalbuminuric DN patients. The child is been symptomatic type 1 DM for 2 years but we do not know exactly its onset as he has never been screened for microalbuminuria and stage IV CKD of our patient corollary with other studies by Bogdanovic²⁰ and Mogensen²¹, who also reported urine albumin more than 300 mg/24 hrs usually associated with end stage renal disease.

As the patient developed chronic kidney disease (stage IV), we started ACE inhibitor for renoprotective effect and to halt the progression of disease, IV calcium gluconate for hypocalcaemia, orally sodibicarb to prevent acidosis, oral calcitrol to prevent osteodystrophy and ca containing phosphate binders for lowering hyperphosphataemia, oral iron, vitamins, zinc and folic acid. He was also suggested diabetic and renal diet. His glycaemic control was achieved by insulin, kept on follow up and ophthalmological consultation was taken.

Conclusion

All children should be screened for type 1DM periodically and good glycaemic control as well as controlling other

risk factors can reduce complications like DN and DR and hence can reduce mortality and morbidity.

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