

Relationship between retinopathy and microalbuminuria among diabetics in Senegal

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ABSTRACT

In diabetes, retinopathy constitutes a major complication because of its evolution to blindness: many risk factors are considered, among which HbA_{1c} and microalbuminuria. Three hundred and twenty seven (327) diabetics were recruited. Eighty eight (88) among them, with a duration of diabetes of at least five years, attended the ophthalmologic clinic for a fluoro-angiographic examination. In the same time, HbA_{1c} and microalbuminuria were determined. Studying the diabetics all together, there was no correlation of retinopathy with either HbA_{1c} or microalbuminuria. But when the type of diabetes was considered, a strong association of microalbuminuria to retinopathy in type 1 diabetes appeared ($p < 0.01$; R.R.=6.77). Nevertheless the sequence was not established in which retinopathy and nephropathy would occur. It is then suggested that all diabetics should be monitored by eye examination and by biology (HbA_{1c} and microalbuminuria) as well, to better prevent micro-angiopathic lesions.

RIASSUNTO

Rapporti tra retinopatia e microalbuminuria nei diabetici in Senegal

Nel diabetico, la retinopatia rappresenta una importante complicazione, capace di generare cecità: la microalbuminuria e la HbA_{1c} rappresentano importanti fattori di rischio. In questo studio sono stati reclutati 327 pazienti diabetici, dei quali 88, con una durata del diabete di almeno 5 anni, erano sottoposti a visita oftalmologica, completata da fluoro-angiografia retinica, ed a misura della microalbuminuria e della HbA_{1c}. Nell'intero gruppo dei diabetici non vi era correlazione della retinopatia con la microalbuminuria o con la HbA_{1c}. Tuttavia, se veniva considerato il tipo di diabete, si osservava una forte associazione della microalbuminuria con la retinopatia nel diabete di tipo 1 ($p < 0,01$; R.R. = 6,77). Non è stato tuttavia possibile stabilire l'ordine con cui retinopatia e nefropatia si verificano. Si suggerisce che tutti i diabetici controllino lo sviluppo di lesioni micro-angiopatiche sia eseguendo gli esami biochimici (microalbuminuria e HbA_{1c}) sia sottoponendosi a visita oftalmologica.

INTRODUCTION

Diabetes is a worldwide disease with chronic complications. Among the latter, there are vascular complications, namely micro and macro-angiopathy. Microangiopathy results in ophthalmic (retinopathy) and renal (nephropathy) lesions. Retinopathy, as a very common complication [1], is a major cause of the blindness cases diagnosed by ophthalmologists [2-4]. Prevalence of diabetic retinopathy is not well documented in Senegal. However the results of a study showed that about 22% of diabetics presented retinopathy [5].

Several risk factors are involved in retinopathy: poor glycemic control [6-7]; duration of diabetes; hypertension; hyperlipidemia [8]. Moreover a controversial role of nephropathy has been evoked [9-12].

Aim of our work was to study the relationship between diabetic retinopathy and nephropathy, in Senegal.

MATERIALS AND METHODS

Three hundred and twenty seven (327) diabetics were recruited at Marc Sankalé anti-diabetic Centre, in Dakar (Senegal). Eighty eight (88) among them, non proteinuric, with a duration of diabetes of at least 5 years, presenting a good ocular transparency, via 90 dioptres Volk glass, were submitted to an eye examination including angiography. Angiography showed 60 patients with retinopathy (Ret+) and 28 without retinopathy (Ret-).

The Ret+ patients included 30 type 1 and 30 type 2 diabetics. They were 41.15 ± 14.75 years old, with a mean duration of diabetes of 10.90 ± 5.10 years.

The Ret- patients (17 type 1 and 11 type 2) were 42.03 ± 14.40 years old and their diabetes was going on for 8.35 ± 3.25 years.

In each patient (either with or without retinopathy), blood was withdrawn on EDTA to determine HbA_{1c} (Roche

Diagnostics; Mannheim; Germany). Urine was also collected in a morning miction [13] and microalbuminuria was measured (Randox; Crumlin; United Kingdom) on a Cobas Mira Plus autoanalyser (Roche Diagnostics; Mannheim ; Germany). Pathological thresholds were set at 10% for HbA_{1c} and 30 mg/l for microalbuminuria.

Statistical analysis was carried out comparing frequencies by chi square and relative risk calculations (R.R.) and significance was set with p<0.05.

RESULTS

Table 1 shows that 45.0% of Ret+ patients had HbA_{1c} higher than 10% against 39.3% in Ret- patients. Furthermore microalbuminuria higher than 30 mg/l was detected in 28.3% of patients with retinopathy against 10.7% in patients without retinopathy. In both cases there were no statistically significant differences when comparing Ret+ and Ret- patients groups.

Then the patients were grouped separately, according to the type of diabetes, and the occurrence of pathologic HbA_{1c} levels and/or microalbuminuria values was assessed in the two groups (table 2). Concerning HbA_{1c}, there were no significant differences as well in type 1 diabetics (56.6% in Ret+ against 41.2% in Ret-) or in type 2 ones (33.3% in patients with retinopathy and 27.3% in patients without retinopathy). Analysis of correlation of microalbuminuria with retinopathy pointed out a strong association in type 1 diabetics (40.0% Ret+ vs 5.9% Ret-; p<0.01 ; R.R.=6.77) while the frequencies were almost the same in patients with retinopathy (13.3%) as in patients without retinopathy (18.2%) in case of type 2 diabetes.

Table 1
Relationship between retinopathy and HbA_{1c} and microalbuminuria in diabetics

Retinopathy	% of patients	
	HbA _{1c} >10%	MAU>30 mg/l
+	45.0	28.3
-	39.3*	10.7*

MAU: microalbuminuria ; * not significant (NS)

Table 2
Relationship between diabetic retinopathy and HbA_{1c} and microalbuminuria (MAU) according to type of diabetes

Marker	Type 1 diabetics (n = 47)		Type 2 diabetics (n = 41)	
	Ret+ (n = 30) %	Ret- (n = 17) %	Ret+ (n = 30) %	Ret- (n = 11) %
HbA _{1c} >10%	56.6	41.2*	33.3	27.3*
MAU>30 mg/l	40.0	5.9**	13.3	18.2*

MAU: microalbuminuria; Ret+: with retinopathy; Ret-: without retinopathy
* not significant (NS) ** p<0.01 R.R.=6.77

DISCUSSION

Periodic monitoring of HbA_{1c} values has been suggested for diabetic subjects [14]. In the studied population, the goal to reach was HbA_{1c} level lower than 8%. However considering the socio-economic status of our patients, this objective was not easy to be reached. So a high proportion of patients were concerned with elevated HbA_{1c} due to poor glycemic control and subsequently the implication of such a marker was not highlighted in the occurrence of retinopathy. Nevertheless, diabetics must be aware of the quality of their glycemic control relatively to the risk of aggravation of microangiopathy [15].

In this paper, the correlation between retinopathy and microalbuminuria varied with the population concerned. If the diabetics were studied all together, there were no significant differences between patients with and without retinopathy. Contrarily it was suggested that retinopathy appeared after nephropathy in one third of diabetics whereas it appeared simultaneously in another third [16]. However other authors concluded that, whatever the type of diabetes might be, retinopathy rather contributed to the development of nephropathy [17]. In the other hand, the analysis according to the type of diabetes showed a positive association only with type 1 diabetes. These results were in accordance with those from several authors [10, 13] and microalbuminuria was likely related to severity of retinopathy [18,19]. However in most of the studies carried out mainly with type 2 diabetic subjects, they found an independent relationship between retinopathy and nephropathy [9, 12].

The occurrence of retinopathy during diabetes is always a very worrying problem.. The linkage of nephropathy to microalbuminuria is not demonstrated in diabetes considered globally. However microalbuminuria constitutes a strong risk factor of retinopathy in type 1 diabetes. So, diabetics should attend ophtalmologists periodically for an early diagnosis of any retinal damage.

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REFERENCES

1. Delage S. Epidémiologie de la rétinopathie diabétique. In: Grange JD; La rétinopathie diabétique; Paris Masson 1995;

- 49-73.
2. Klein R, Klein BEK, Moss S, Davis MD, DeMets DL. The Wisconsin Epidemiology Study of Diabetic Retinopathy. II. Prevalence and risk of diabetic retinopathy when age at diagnosis is less than 30 years. *Arch ophthalmol* 1984; 102: 520-6.
 3. Reaznik Y. Atteintes ophtalmologiques. In: Barailles F, Got L, Lalau J-D; Atlas des complications; Editions Pradel France 1994; 29-35.
 4. Balo KP, Mensah A, Koffi-Gue B. La rétinopathie diabétique: une étude angiofluorographique chez le Noir africain. *Med Afr N* 1995;42: 402-5.
 5. Ndiaye MR, Cisse A, de Medeiros M, Wane A et al. Prévalence de la rétinopathie diabétique au CHU de Dakar. *Dakar Médical* 1999;44:158-61.
 6. Goldstein DE, Little RR. Monitoring glycemia in diabetes. Short terms assessment. *Curr Therap Diab* 1997;26:475-86.
 7. The Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993; 329:977-86.
 8. Robert D, Silver MD, FRCPR. Diabetes and its microvascular complications: Basic concepts and practical solutions. *Can Diab* 1998;11:1-13.
 9. Sobngwi E, Mbanya JC, Moukouri EN, Ngu KB. Microalbuminuria and retinopathy in a diabetic population in Cameroon. *Diabetes Res Clin Pract* 1999; 44: 191-6.
 10. Lloyd CE, Orchard TJ. Diabetes complications: the renal-renal link. *Diabetes Care* 1995;18:1034-6.
 11. Collins VR, Dowse GK, Plehwe WE, Imo TT et al. High prevalence of diabetic retinopathy and nephropathy in Polynesians of Western Samoa. *Diabetes Care* 1995;18: 1140-9.
 12. Wirta O, Pasternack A, Mustonen J, Laippala P, Lähde Y. Retinopathy is independently related to microalbuminuria in type 2 diabetes mellitus. *Clin Nephrol* 1999;51:329-34.
 13. Raynauld E, Brun JF, Fédou C, Puech-Cathala AM et al. La micro-albuminurie, marqueur précoce d'atteinte rénale, est-elle aussi un facteur de risque cardio-vasculaire? *Ann Biol Clin* 1998; 56:671-9.
 14. American Diabetes Association. Clinical practice recommendations 2000. *Diabetes Care* 2000;23:S1-S116.
 15. Grimaldi A. Surveillance biologique du diabète sucré: le point de vue du diabétologue. *Ann Biol Clin* 1999;57: 458-62.
 16. Regenbogen L, Coscas G, Debrash S. Œil et rein. Editions Techniques. *Encycl Med Chir (Paris-France). Ophtalmologie*; 21-453-A-25; *Néphrologie-Urologie*, 18-059-B-10, 1995; pp. 9.
 17. Villar G, Garcia Y, Goicolea I, Vazquez JA. Determinants of development of microalbuminuria in normotensive patients with type 1 and type 2 diabetes. *Diabetes Metab* 1999; 25:246-54.
 18. Gilbert RE, Tsalamandris C, Allen TJ, Colville D, Jerums G. Early nephropathy predicts vision-threatening retinal disease in patients with type 1 diabetes mellitus. *J Am Soc Nephrol* 1998;9:85-9.
 19. Guerci B, Meyer L, Sommer S, George JL et al. Severity of diabetic retinopathy is linked to lipoprotein (a) in type 1 diabetic patients. *Diabetes Metab* 1999;24:412-8.