Prevalence of hypertension in renal disease

Natalia Ridao, José Luño, Soledad García de Vinuesa, Francisco Gómez, Alberto Tejedor and Fernando Valderrábano

Hospital General Universitario Gregorio Marañón, Madrid, Spain

Abstract

Background. Hypertension (HTN) is very frequent in patients with renal disease and its prevalence increases as renal failure progresses.

Methods. We studied the prevalence of HTN in 1921 patients with different nephropathies. Patients on dialysis and renal transplant patients were not included in the study. HTN was defined as SBP > 140 and/or DBP > 90 mmHg, or requiring antihypertensive therapy.

Results. The prevalence of HTN in the total group of patients with renal diseases was 60.5%, but this prevalence varied widely depending upon the type of underlying nephropathy. The prevalence of HTN was practically universal in patients with renal vascular disease (93%) and in patients with established diabetic nephropathy (87%), and 74% of the patients with polycystic kidney disease, 63% of the patients with chronic pyelonephritis and 54% of the patients diagnosed with glomerulonephritis were hypertensive. The prevalence of HTN in patients with renal insufficiency (80%) is significantly higher than that in patients without renal insufficiency (43% P < 0.001). In a multiple logistic regression analysis, the independent risk factors defining HTN in renal patients were: renal failure, age, the presence of diabetes, hypertriglyceridaemia and proteinuria. Antihypertensive treatment consisted of diet alone in 4% of the patients, one drug in 45%, two drugs in 36%, three medications in 13% and more than three drugs in 2.5%. The angiotensin-converting enzyme (ACE) inhibitors were the most frequently prescribed drug (39% of the patients treated in monotherapy) followed by calcium channel blockers (27%), diuretics (18%) and β-blockers (9%). The most common combined therapy was a diuretic plus an ACE inhibitor. The percentage of patients with BP controlled according to current recommendations for renal patients (BP < 130/85) was very low; SBP in only 49% and DBP in 24%. Control of both was only achieved in 10% of the patients.

Conclusions. There is a high prevalence of HTN in renal patients, which depends on the type of nephropathy and the degree of renal failure. Other independent risk factors for HTN in patients with renal disease are: advanced age, the presence of diabetes, hypertriglyceridaemia and the severity of proteinuria. BP control in renal patients is quite poor and should be improved to reduce progression of the renal disease.

Keywords: antihypertensive drugs; blood pressure control; hypertension; prevalence of high blood pressure; renal disease

Introduction

Hypertension (HTN) is very frequent in patients with renal disease and its prevalence increases as chronic renal failure (CRF) progresses. The majority of patients starting renal replacement therapy were reported to have suffered from high blood pressure [1]. The prevalence of HTN in renal patients depends fundamentally on the degree of the renal failure and the type of nephropathy, but varies also, as in essential HTN, with age, sex and body mass index [2].

Evidence shows that HTN is a risk factor in the progression of CRF, independent of the underlying renal disease [3–6]. Strict control of blood pressure (BP) is, therefore, essential in avoiding or delaying the decrease in renal function [7,8] as well as reducing cardiovascular risk, which is greater in patients with CRF [9,10]. The recommendation of the Sixth Report of the Joint National Committee (VI JNC, 1997) [11] proposes BP control in patients with nephropathy at 130/85 mmHg and at 125/75 mmHg if proteinuria is higher than 1 g/day. However, HTN in these patients is difficult to control and usually requires the use of various drugs [2].

Here we studied the prevalence of HTN in renal patients at a Nephrology Clinic, while at the same time analysing the clinical and biochemical parameters which define the presence of HTN in patients with renal disease. Finally, we collected data regarding
the different antihypertensive treatments in use and the degree of BP control according to current recommendations [11].

Materials and methods

We studied the prevalence of HTN in 1921 patients with different renal diseases who were followed-up periodically during their visits to the Department of Nephrology at the Hospital General Universitario Gregorio Marañón in Madrid.

Renal disease was defined as the presence of at least one of the following alterations: renal failure [creatinine clearance (CrC) < 70 ml/min], proteinuria, haematuria, other alterations of renal function, or evidence of renal disease through either radiological or histological study techniques. Patients on dialysis and renal transplanted patients were not included in the study.

HTN was defined as systolic BP (SBP) of > 140 mmHg or diastolic BP (DBP) of > 90 mmHg, or requiring the use of antihypertensive medication. BP readings were taken three times consecutively after 10 min of rest, at 2-min intervals, with a semi-automatic, homologated blood pressure monitor (OMRON 705 CP®), taking the mean of the three readings.

Statistical analysis

All the data were analysed using the software package R-Sigma Babel (Horus Hardware®). Results are expressed as mean ± SD. Student’s t-test was used to compare means of numeric variables. The association of qualitative characters was proven using the chi square test. We used standard regression analysis and correlation coefficient (Pearson’s r) to assess relationships between continuous variables. Multiple logistic regression was used later to establish the independent variables that indicate the presence of HTN in patients with renal pathologies.

Results

The prevalence of HTN in the total group of patients with renal diseases was 60.5%, but this prevalence varied widely depending upon the type of underlying nephropathy (Table 1). The prevalence of HTN was practically universal in patients with renal vascular disease (93%), in whom HTN is presumed to be the cause of CRF. Prevalence was high in patients diagnosed with established diabetic nephropathy (87%), polycystic kidney disease (74%), and in those with microalbuminuria (73%), many of whom had incipient diabetic nephropathies. HTN was less prevalent in patients with chronic pyelonephritis (63%), chronic interstitial nephropathies (62%), glomerulonephritis (54%), kidney stone disease without CRF (27%) and microhaematuria (22%).

Table 2 shows the prevalence of HTN in the different types of glomerulonephritis (GN). HTN was more frequent in patients diagnosed with membranoproliferative GN (83%), focal and segmental GN (77%) and endo- and extracapillary GN, but less frequent in those with mesangial IgA GN, membranous GN and idiopathic nephrotic syndrome (54, 40 and 25%, respectively).

We also observed that as renal failure worsens, the prevalence of HTN increases significantly: 43% in patients with CrC > 70 ml/min, 79% in those with CrC between 30 and 70 ml/min (P < 0.05) and 83% in patients with advanced CRF (P < 0.001).

In comparing clinical data of normotensive and hypertensive patients, we observed that the patients with HTN were significantly older, with more pronounced renal insufficiency, higher proteinuria, with higher cholesterol and triglyceride serum levels and with more severe hyperparathyroidism, and they also showed greater anaemia.

The variables which correlated significantly with BP levels in univariate analysis such as age, CrC, proteinuria, cholesterol, HDL, LDL, triglycerides, calcium, parathyroid hormone and haemoglobin, as well as sex and aetiology of the renal disease, were analysed by multiple logistic regression. In this way, the following independent factors defining HTN in patients with renal disease were identified: the degree of renal failure, age, the presence of diabetes mellitus, hypertriglyceridaemia and proteinuria (Table 3).
Table 3. Independent variables defining the presence of HTN in renal disease (logistic regression)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Regression coefficient</th>
<th>T</th>
<th>PR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine clearance</td>
<td>0.017</td>
<td>7.2</td>
<td>0.0001</td>
</tr>
<tr>
<td>Age</td>
<td>+0.025</td>
<td>5.2</td>
<td>0.0001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>0.65</td>
<td>2.9</td>
<td>0.002</td>
</tr>
<tr>
<td>Triglyceridaemia</td>
<td>+0.008</td>
<td>2.7</td>
<td>0.006</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>+0.13</td>
<td>2.5</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Antihypertensive treatment consisted of diet alone in 4% of the patients, one drug in 45%, two drugs in 36% and more than three drugs in 16%. ACE inhibitors were the most frequently used drugs (39% in monotherapy), followed by calcium channel blockers (CCBs) (27%), diuretics (18%) and β-blockers (9%). The most common combined therapy was a diuretic with an ACE inhibitor and, less frequently, a diuretic plus a CCB or an ACE inhibitor plus a CCB.

According to the latest recommended criteria for BP control in patients with renal disease (BP < 130/85 mmHg), we found that SBP was controlled in 24% and DBP in 49%. Adequate control of both was only achieved in 9.5% of the patients, which improved to 15% after 6 months of follow-up. BP control was poorer in patients with diabetic nephropathy (6%). When the criteria of BP control (<125/75 mmHg) were evaluated in patients with proteinuria > 1 g/day, BP control was strikingly lower (SBP 7%, DBP 18% and both 4%).

Discussion

HTN is found frequently in patients with renal disease, and its prevalence is influenced by a variety of factors. The most important of these is the degree of renal failure, given that as renal function deteriorates, the frequency of HTN increases significantly to such an extent that virtually all patients starting dialysis may be hypertensive. These results coincide with those found by other groups [2,12,13]. However, in renal patients without renal insufficiency, the prevalence of HTN is higher than that found in the general population; 43% of patients with nephropathies are hypertensive before reaching renal failure, which probably indicates that there are certain changes in renal function which activate the vasoactive hormonal systems and sodium excretion that determine the appearance of HTN before significant alterations in glomerular filtration are observed.

In this study, we observed factors other than the degree of renal failure which influence the prevalence of HTN in renal patients. Just as in the general population, age and diabetes (especially type 2) are also risk factors for the development of HTN in renal patients, and arteriosclerosis is more frequent. Furthermore, proteinuria is another factor defining the presence of HTN in these patients. This fact makes strict control of BP, particularly in those patients with proteinuria, of essential importance, given the two factors for the progression of renal disease, proteinuria and HTN. Finally, the frequent association between HTN and hypertriglyceridaemia in renal patients implies a greater risk of arteriosclerosis [14].

The American study ‘Modification of Diet in Renal Disease’ (MDRD) [2] included 1795 patients with CRF, identified the male sex (although slightly), the black race and the body mass index as predictive factors of HTN, in addition to renal failure and age.

As seen in other studies [2,10,12,15,16], we confirmed that the prevalence of HTN also varies according to the underlying nephropathy. HTN is very frequent in patients with renal vascular disease, diabetic nephropathy and polycystic kidney disease. It is less frequent in chronic interstitial nephropathy and GN, and similar to that of the general population in renal stone disease and isolated microhaematuria. HTN appears in a very low percentage of tubulopathies (5%), probably because this kind of nephropathy usually appears at an early age. The relatively low prevalence of HTN in patients suffering from GN is striking (54%), compared with that found in other older studies [2]. This may be because, in recent years, at least in Spain, the incidence of those types of GN associated with a higher frequency of HTN, such as membranoproliferative or focal and segmental GN, has decreased, while that of those types of GN producing HTN less frequently, such as mesangial or membranous GN, has increased [17].

Antihypertensive medication is usually required in > 95% of renal patients, and normally consists of two or more drugs. These data are consistent with the data obtained in the MDRD and other studies [2,18–20]. The MDRD study showed that 1.9 drugs were necessary to control BP at < 125/75 mmHg and 1.5 for a BP of < 140/90. The mean number of drugs required was higher in patients with severe CRF (2.1 and 1.8, respectively). A study by Schwenger and Ritz [19] showed that > 50% of patients with renal insufficiency required treatment with three or more antihypertensive drugs. The HOT study also observed that hypertensive patients with renal disease required a greater number of antihypertensive drugs compared with those without renal pathology [20]. The most commonly used drugs were ACE inhibitors alone or combined, principally with diuretics in an attempt to add the antiproteinuric and renoprotective effects attributed to ACE inhibitors to the antihypertensive action [21,22]. The data obtained show that BP control, according to recent recommendations, is still poor, especially with regard to SBP.

We conclude that there is a high prevalence of HTN in renal patients, depending on the type of nephropathy and the severity of renal failure. The presence of diabetes, advanced age, proteinuria and hypertriglyceridaemia are independent risk factors in the development of HTN in renal patients. Furthermore, the degree of BP control, particularly that of
SBP, in these patients is poor in relation to current recommendations and should be improved to reduce the progression of renal damage principally in those nephropathies with significant proteinuria. Antihypertensive treatment with various drugs is necessary to achieve this objective.

References