Hypertension and parenchymal disease of the kidney are closely interrelated. Most primary renal diseases eventually disturb sodium and volume control sufficiently to produce clinical hypertension. Both on theoretical and practical grounds, many authors argue that any sustained elevation of blood pressure depends ultimately on disturbed renal sodium excretion, i.e., altered pressure natriuresis. Hence, some investigators argue that a clinical state of hypertension represents de facto evidence of disturbed (or “reset”) renal function even before changes in glomerular filtration can be measured.

Many renal insults further induce inappropriate activation of vasoactive systems such as the renin-angiotensin system, adrenergic sympathetic nerve traffic, and endothelin. These mechanisms may both enhance vasoconstriction and act as mediators of additional tissue injury by altering the activity of inflammatory cytokines and promoters of interstitial fibrosis.

Arterial hypertension itself accelerates many forms of renal disease and hastens the progression to advanced renal failure. Recent studies have firmly established the importance of blood pressure reduction as a means to slow the progression of many forms of renal parenchymal injury, particularly those characterized by massive proteinuria. Over the long term, damage to the heart and cardiovascular system resulting from hypertension represents the major causes of morbidity and mortality for patients with end-stage renal disease.

Here are illustrated the roles of renal parenchymal disease in sustaining hypertension and of arterial pressure reduction in slowing the progression of renal injury. As discussed, parenchymal renal disease may refer to either unilateral (uncommon) or bilateral conditions.
2.2 Hypertension and the Kidney

FIGURE 2-1
Forms of unilateral renal parenchymal diseases related to hypertension. Many unilateral abnormalities, such as congenital malformations, renal agenesis, reflux nephropathy, and stone disease, do not commonly produce hypertension. However, some unilateral lesions can produce blood pressure elevation. Data for each of these are based primarily on demonstrating unilateral secretion of renin and resolution with unilateral nephrectomy. It should be emphasized that unilateral renal disease does not reduce the overall glomerular filtration rate beyond that expected in patients with a solitary kidney. It follows that additional reductions in the glomerular filtration rate must reflect bilateral renal injury.

FIGURE 2-2
Angiogram and nephrogram of a persistent fractured kidney. The kidney damage shown here produced hypertension in a young woman 2 years after a motor vehicle accident. Measurement of renal vein renins confirmed unilateral production of renin from the affected side. Blood pressure control was achieved with blockade of the renin-angiotensin system using an angiotensin II receptor antagonist (losartan). Many traumatic injuries to the kidney produce temporary hypertension when a border of viable but underperfused renal tissue remains.

Prevalence of Hypertension in Chronic Renal Disease

FIGURE 2-3
Prevalence of hypertension in chronic renal parenchymal disease. Most forms of renal disease are associated with hypertension. This association is most evident with glomerular diseases, including diabetic nephropathy (DN) and membranoproliferative glomerulonephritis (MPGN), in which 70% to 80% of patients are affected. Minimal change nephropathy (MCN) is a notable exception. Tubulointerstitial disorders such as analgesic nephropathy, medullary cystic diseases, and chronic reflux nephropathies are less commonly affected. APKD — adult-onset polycystic kidney disease; CIN — chronic interstitial nephritis; FSGN — focal segmental glomerulosclerosis; GN — membranous glomerulonephritis. (Data from Smith and Dunn [1].)
FIGURE 2-4
Prevalence of hypertension requiring therapy as a function of the degree of chronic renal failure in the Modification of Diet in Renal Disease (MDRD) trial on progressive renal failure. The mean age of these patients was 52 years, with glomerular disease (25%) and polycystic disease (24%) being the most common renal diagnoses in this trial. In Study B, more than 90% of patients were treated with antihypertensive agents, including diuretics, to achieve an overall average blood pressure of 133/81 mm Hg. In general, the more severe the level of renal dysfunction, the more antihypertensive therapy is required to achieve acceptable blood pressures. Patients with glomerular filtration rates (GFRs) below 10 mL/min were hypertensive in 95% of cases. NHANES—National Health and Nutrition Examination Survey. (Data from Klahr and coworkers [2].)

FIGURE 2-5
Hypertension in acute renal disease. Acute renal failure is defined as transient increases in serum creatinine above 5.0 mg/dL. During the course of acute renal failure, worsening of preexisting levels or newly detected hypertension (>140/90 mm Hg) is common and almost universally observed in patients with acute glomerulonephritis (GN). Many of these patients have lower pressures as the course of acute renal injury subsides, although residual abnormalities in renal function and sediment may remain. Blood pressure returns to normal in some but not all of these patients. Overall, 39% of patients with acute renal failure develop new hypertension. IN—interstitial nephritis. (Adapted from Rodriguez-Iturbe and coworkers [3]; with permission.)

FIGURE 2-6 (see Color Plate)
Micrograph of an onion skin lesion from a patient with malignant hypertension.