Chapter I

Introduction

Calcium is an important factor in the regulation of blood pressure. It plays a central role in the coupling between excitation and contraction of striated and vascular smooth muscle cells (Seidel and Bohr, 1971; Bohr, 1973). Moreover, variations in the concentration of calcium in the blood may be accompanied by parallel changes in blood pressure. A rapid reduction of plasma calcium concentration has been shown to induce hypotension in man (Shackney and Hasson, 1967; Llach et al., 1974) and in the experimental animal (Maxwell et al., 1963). Conversely, both acute (Moore and Smith, 1963; Weidmann et al., 1972) or chronic forms of hypercalcemia (Hellstroem et al., 1958; Earll et al., 1966; Rosenthall and Roy, 1972) may be associated with hypertension. The mechanism by which excess calcium induces hypertension is still unclear. Theoretically, hypercalcemia could influence blood pressure by direct action on the vascular muscle cells, or its cardiovascular effect could be mediated by other blood pressure-regulating factors; pressor substances, such as renin and catecholamine (Marone et al., 1980).

Several data have been suggested that plasma renin levels during acute or chronic hypercalcemia are unchanged or slightly decreased (Weidmann et al., 1972; Kisch et al., 1976). Thus, the increase in blood pressure observed during acute or chronic

hypercalcemia could not be accounted for an alteration of plasma renin activity.

The release of catecholamine has been shown to be dependent upon calcium ion activity (Rubin, 1970). Calcium ion could facilitate the release of epinephrine from the adrenal medulla (Douglas and Rubin, 1961; Greenberg and Kolen, 1966) and norepinephrine from sympathetic nerve ending (Kirpeker and Misu, 1967; Boullin , 1967) resulting to increase in vascular reactivity. It seems likely, therefore, an increase in vascular resistance is a major underlying the hypercalcemia-induced hypertension (Shaul et al., 1986). It remains uncertain whether the increase in vascular resistance is the direct effect of calcium ion influx through voltage-operated channel on vascular smooth muscle cells or the indirect effect of calcium ion influx through receptor-operated channel which is opened by catecholamine that facilitated release from sympathetic nerve ending to bind with alpha-1 adrenergic receptor, or both.

The present investigation will gain deeper insight into the mechanism(s) responsible for the alteration of blood pressure, cardiovascular and renal functions following the acute hypercalcemia by using calcium channel blocker (Verapamil) and selective alpha-1 adrenergic blocker (Prazosin).