II. Medizinische Abteilung des Städtischen Krankenhauses München-Schwabing

Hemodynamic response to digitalization in patients with hypertensive cardiovascular disease

Die hämodynamische Wirkung von Digitalis bei Patienten mit arterieller Hypertonie

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With 4 figures

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Summary

Twenty-eight patients with hypertensive cardiovascular disease (HCD) and incipient myocardial dysfunction underwent hemodynamic studies at rest and during exercise before and 30 minutes after administration of 0.6 mg beta-methyl-digoxin intravenously. Measurements were made during right heart catheterization with a balloon-tipped catheter. The hemodynamic changes after administration of digitalis did not demonstrate a consistent and uniform improvement of cardiac performance in all patients with HCD and myocardial dysfunction. When separating 11 patients with previous myocardial infarctions or documented coronary artery disease (CAD) (= Group I) from the remaining 17 subjects without clinical and/or angiographic signs of CAD (= Group II), there were significant differences in the hemodynamic response to digitalis:

In Group I, pulmonary artery wedge pressure (PAWP) after digitalis decreased only slightly and insignificantly from 8.7 to 7.4 mm Hg at rest and from 27.6 to 26.4 mm Hg during steady state exercise. Cardiac output (CO) remained essentially unchanged with a tendency to decrease after digitalis: 5.9 vs. 5.8 L/min at rest and 11.5 vs. 11.1 L/min during exercise.

At rest, even patients of Group II showed only minor decrease of PAWP from 8.8 to 7.2 mm Hg; during exercise these patients demonstrated marked improvement of cardiac performance with a significant decrease of PAWP after digitalis from 27.8 to 22.3 mm Hg (p < 0.01). With one exception, there was a more or less pronounced reduction of PAWP after the drug was given. No significant change of CO after digitalis was measured in this group: 6.2 vs. 5.9 L/min at rest and 13.4 vs. 13.5 L/min during exercise.

The different hemodynamic patterns of responders and non-responders to the glycoside will be discussed.

Data from the Framingham study reveal that among the etiologic precursors of congestive heart failure, the dominant one is clearly hypertension, which was found to precede failure in 75 per cent of the cases (15). It has been shown by the Veterans Administration Cooperative Study Group on Antihypertensive Agents (29) that treatment of hypertension
prevents the development of heart failure. It is conceivable that earlier
digitalization might enhance the effectiveness of antihypertensive agents
in patients with hypertensive cardiovascular disease (HCD). However,
although well defined in the treatment of overt heart failure, the role of
digitalis in the management of hypertension without heart failure is less
well established.

In previously performed studies (16) we attempted to assess the earliest
type of hemodynamic dysfunction in patients with hypertension. We de-
monstrated that hemodynamically evident ventricular dysfunction pre-
cedes the clinical manifestation of failure. In a group of 91 patients with
HCD without any clinical symptoms and signs of cardiac failure, pul-
monary artery wedge pressure (PAWP) was found to be elevated in
44 patients during exercise, indicating left ventricular dysfunction. In the
remaining 47 patients PAWP did not exceed 20 mm Hg. The average car-
diac output (CO) was normal at rest and during exercise in both groups,
suggesting that those patients with elevated PAWP exhibited merely “ab-
normal left ventricular dynamics” and not yet depressed ventricular
pumping performance (20, 22). The fact that flow increases normally even
though there may be a rise in filling pressure could be due to both in-
creased stiffness of the ventricular wall and myocardial failure. Reduced
ventricular compliance may account to a high degree for the elevation
of filling pressure in hypertensive patients with and without coronary
artery disease (CAD). In order to define whether additional reduction in
the contractile state of the myocardium plays an important role in the
elevation of filling pressures, the administration of positive inotropic drugs
should be of discriminating value. The following study was designed to
assess the hemodynamic response to digitalis in patients with HCD who
exhibited abnormal left ventricular filling pressures during exercise. The
results of this preliminary report may contribute to the debate whether
digitalis is of benefit in hypertension which is not complicated by cardiac
failure.

Subjects and method

Our study group was composed of 28 patients with HCD. Most of the
patients had mild to moderate blood pressure elevation. Those patients
were admitted into the study group who had blood pressure values of
> 155 mm Hg systolic pressure and/or > 90 mm Hg diastolic pressure,
and when these pressures were recorded repeatedly during their hospital
stay. None of the patients were in heart failure at the time of study, as
characterized by the lack of rales at the lung bases, no cardiomegaly
shown on chest X-ray film and no history of dyspnea at rest and during
exertion. The mean age of the patients in group I and group II was 55
and 54 years, respectively. Most of them had not previously received any
digitalis preparation and the others had discontinued use of digoxin at
least ten days before the study. With the exception of eight patients who
had excessive blood pressure elevation upon admission to hospital, anti-
hypertensive treatment had either not been undertaken at all, or had
been discontinued at least five days prior to this study. Eleven of the
patients had a history of CAD and in most of them, this diagnosis was