Chronic Painless Recording of Intra-Arterial Blood Pressure in Unanesthetized Dogs

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Abstract—A method for measuring intra-arterial blood pressure in unanesthetized dogs for as long as 12 months through the implantation of polyvinyl catheters in the abdominal aorta is described. Direct intra-aortic pressures ranged from 135 to 204 mm Hg for systolic blood pressures and 57 to 123 mm Hg for diastolic blood pressures over periods ranging from 8 to 12 months. This method provides a means for following blood pressure for a long period with minimal disturbance in the behavior of the animal. This also makes possible an additional cardiovascular measurement in the studies of the cardiac conditional reflexes.

The chronic recording of painless intra-arterial blood pressure in dogs was one of the most difficult problems in physiology until very recently. Most measurements of intra-arterial blood pressure required highly trained docile dogs in which the femoral artery was punctured with a cannula or needle (Pavlov, 1879; Kolls and Cash, 1923; Hamilton, Brewer and Brotman, 1934). This technique is limited in its use because continuous puncture can injure the artery and can be painful. The auscultatory method (Allen, 1923; Wilhelm, Waldman and McGuire, 1931), which avoids the injury to the artery, usually causes external inhibition in the animal during inflation of occlusion cuffs. Reliable recordings of indirect blood pressure can be taken only if the animals have been familiarized with the inflation of the occlusion cuff. Otherwise, the emotional disturbance will be superimposed on the recording of indirect pressure (Dykman and Gantt, 1960). Furthermore, the auscultatory method cannot be used for beat-by-beat measurements of blood pressure.

The solution of this problem has been possible due to scientific and technological progress: 1) advances in the development of stable and potent anticoagulants; 2) technological advances in the manufacturing of nontoxic plastics which neither react actively with biological tissues nor kink or crack easily; 3) advances in electronic instrumentation such as the development of sensitive strain-gage pressure transducers not available a few years ago;

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4) last, but not least, advances in the technology of chronic implantation with the innovation of techniques for the proper fixation of blood-pressure catheters to arteries using anchoring rings built in or glued to the plastic tubing (Gaertner, 1964).

Methods

Blood pressures were recorded inside a soundproof room with an attenuation of 81 db. The room temperature was controlled to 74° F. Techniques for the implantation of blood-pressure catheters have been described elsewhere (Perez-Cruet, Plumlee and Newton, 1966). The blood pressure was measured with a Statham P23De strain-gage pressure transducer. Calibration of the strain-gage was performed with a mercury manometer and readings were made in millimeters of mercury (mm Hg). Most measurements reported