Intracranial Angiography by Percutaneous Puncture of the Subclavian Artery Utilizing a Subclavicular Approach

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A rteriographic study of the posterior intracranial circulation frequently is necessary; there is a growing trend to perform both anterior and posterior circulatory studies of the brain. It is indeed desirable that posterior arteriography, the more difficult of the two studies, be done as a routine procedure in cases of suspected vascular occlusive disease and in subarachnoid hemorrhage, together with the more usual anterior study. The principal topic of this paper is the discussion of a simplified technique for visualization of the vertebral-basilar circulation; secondarily, a combined wire-guide-cannula method is discussed such that four-vessel angiography may be obtained with a single, relatively easy and safer percutaneous single-puncture maneuver.

Several methods for posterior circulatory study have been employed over the years.2-4,12 Our experiences with the present method of puncture of the subclavian artery were begun independently in November, 1961. At this time Pouyanne et al.8 had reported a preliminary trial of such a technique. The work of Amplatz and Harner1 was soon to be reported. Though anatomically similar to the method reported here, these two groups used certain variations in approach or equipment that are different from those presented here.

More usually the various direct percutaneous punctures of the subclavian artery have met with a measurable percentage of complication; most notable are hemomediastinum and hemothorax or pneumothorax (even though the incidence of severe complication associated with these is small).2 The present technique utilizes a different anatomical approach from the more usual ones and appears to obviate the above-mentioned complications. In addition, the present method is felt to be easier to perfect for the beginning or average angiographer. Later, as will be shown in the combined technique using the wire-guide cannula, the matter of direct digital control over the site of the puncture will be stressed. One can see that with the site of the puncture lying exactly between the palpating finger and the firm background of the first rib, hematomas common to maneuvers of the catheter can be prevented—not possible when the puncture is made remote to the digital palpation, e.g., within the upper mediastinum.

I. The Subclavicular Technique

The approach to the subclavian puncture mentioned here utilizes a subclavicular, upward direction for the needle, perforating the artery near its superior apical loop (Fig. 1). This point lies at the emergence of the artery from behind the scalenus anticus muscle as it rests on the surface of the first rib.

The puncture itself is made in such a way that hematomas, whenever produced in this technique, have occurred only in the medial aspect of the posterior (subclavicular) triangle of the neck, an area of little consequence. In addition, the angle of approach to the artery itself is away from and over the pleura. In 50 subclavian punctures, as of June, 1962, one case of pneumothorax was encountered. We believe that this exceptional case "proves the rule" in the over-all safety of the technique. In this particular case, the cachectic patient had an abnormally acute angulation between the clavicle and the midline of the body. By swinging the

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clavicle upward, a puncture made perpendicular to the clavicle becomes more directly medial and inferior. The superior aspect of the first rib offered no protection, with this direction of the needle, and the pleura was penetrated. A thoracic drain relieved the situation without further complication.

It therefore is suggested that in patients with very acute clavicular angles, the penetration be made with the needle moved more medial than the halfway point of the clavicle; the direction of attack is then still upward and over the surface of the first rib. As a general rule, unless the pleura were to project considerably above the level of the rib, it is unlikely that pleural penetration could result.

Fig. 1 is an anatomical illustration showing the location of the subclavian artery in relation to the *scalenus anticus*, first rib, and the clavicle.

**Method**

The initial landmark is located by halving the distance between the sternal notch and the acromial tip of the clavicle. At this point, the clavicle makes an anterior bend and becomes more promi-

![Angiography by Puncture of Subclavian Artery](image)

**Fig. 1.** Retouched photograph and superimposed anatomical drawing illustrating the site and angle of puncture, and the important structures beneath. 'X' marks the spot halfway from sternal notch to acromial tip. C.C.A. = Common carotid artery. I.M. = Internal mammary artery. S.C.A. = Subclavian artery. V.A. = Vertebral artery.