A New Method of Autotomography with Cerebral Angiography (Angioautotomography)

H. Shimizu, O. Sató and M. Kobayashi

Department of Neurosurgery and Radiology, Kantō Teishin Hospital, Tokyō, Japan

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Summary. A new method of autotomography for cerebral angiography, accomplished by means of a simple and handy device, has made it possible to take arbitrary tomographic planes of angiograms which result in clear cut views of the tomogram. The principle of the device is described, the method of use explained and representative films, produced by this new method, are demonstrated.

Introduction

In addition to the recent advances of various methods of cerebral angiography, angiotomography is now becoming recognized as one of the significant techniques to be added to the angiographic capabilities. It is a very informative aid in diagnosing the location and origin of aneurysms or to visualize the fine contours of deep vessels [1, 2, 3, 4]. But angiotomography requires a special work area with tomographic equipment, so the practical application of this method is now limited, as far as its routine use is concerned. So, the technique of autotomography is often tried as a convenient substitute for angiotomography [5] because the method is very simple and does not require special facilities. However, there is a great limitation to this substitute technique since it can provide only a midline tomogram.

For this reason we have developed a new method of autotomography which requires a simple device that makes it possible to take arbitrary tomographic planes. Because the device is simple and handy, the method can be practised in the course of routine examinations. This report describes the principle and the method of our new device and demonstrates several films taken by this method.

Principle and Method

For ordinary autotomography [6] the head is rotated 5—7 degrees to the right and to the left of the midline, the axis of rotation of the head passing through the 3rd ventricle, aqueduct and 4th ventricle, while the exposure is being made. This is the opposite of regular tomography where there is no movement of the patient but the tube and film are moved. As there is minimal movement of the structures in the axis of rotation, these structures are delineated clearly and the structures outside of this plane are blurred by motion, thereby subtracting them for all practical purposes. So, although the midline structures are outlined clearly, therein lies the limitations of this simple method, for the harvest is limited to one plane only, the midline.

Therefore we developed the principle of autotomography further, speculating that by producing a device for changing the axis of rotation at will, to any desired point in the head of the patient, the usual autotomographic midline limitation could be removed and sections lateral to the midline produced of the particular plane containing the movable axis of rotation. This was the reasoning which led to the invention of our new instrument which is shown in Fig. 1.
With this device it is possible to change the rotatory pivot as much as 6 cm laterally from the midline and 5 cm vertically from the height of the meatus. In practical use, the patient's head is fixed in the hemicylindrical box with radiolucent pads, and the long axis of the neck is always kept straight so as not to put strain on the atlantoaxial joint during rotation. The rotatory pivot is confirmed accurately with the aid of the scale. The apparatus rotates quite smoothly by automatic motor power, so that very fine sections can be obtained.

**Results**

Fig. 3 shows a normal example of an angioautotomogram taken by our new method. The course of the anterior cerebral artery is followed finely in the median tomogram. The carotid siphon and the pars insularis are very sharply visualized in 1 cm and 4 cm lateral sections. Fig. 4 is a case of a middle cerebral artery aneurysm. It is impossible to identify the lateral shape of the aneurysm in the ordinary carotid angiogram, but the angioautotomogram, 4 cm lateral to the midline, clearly shows the upward directed aneurysm and its neighboring arteries. Fig. 5 is a case of recurrent angioblastic meningioma. The tumor stain is partly obscured, so it is quite difficult to determine the correct extent of the tumor infiltration and its relevant arteries. Angioautotomography, however, could defi-

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Fig. 1. a) In usual autotomography the movement of the median plane is minimal compared with other parts, so the median tomogram is obtained by lateral X-ray projection. b) Then, if it is possible to change the rotatory pivot laterally to any desired place, a section of the lateral plane containing this point will be produced.

Fig. 2. a) Photography of our new apparatus, b) performing angioautotomography using this apparatus.