REFERENCES

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AN INEXPENSIVE SEMI-AUTOMATIC SERIALOGRAPHIC APPARATUS FOR ANGIOGRAPHY

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Numerous articles have advocated the need for rapid serial cerebral angiography.1–10 The apparatus required is usually expensive, or technically difficult to use. The following method of obtaining rapid multiple radiographs is presented so that the benefits of serial angiography may be had with a minimum of expense and technical personnel.

The method utilized consists of an easily constructed apparatus which allows serial radiographs to be made at one-second intervals by one technician. The x-ray cassettes are permitted to fall in position and are exposed semi-automatically through the interval timer of an x-ray machine. This is accomplished by the manual opening of the spring door, and an exposure is made when the door closes as a new cassette falls into position.

DETAILS OF CONSTRUCTION

The overall dimension of the machine is 63 inches high by 18 inches wide by 23 inches deep. This is built to accommodate a standard 10 × 12 inch cassette. Slight variations of width are necessary if other sizes are used (Fig. 1).

The sides are of 1/4 inch plywood and are separated 181/2 inches so a 10 × 12 inch cassette may slide freely on its side. The front panel is in three parts. The upper and lower sections are lead-covered plywood while the middle third is masonite. The back is open except for the cross pieces of the 2 × 4's for stability. The plywood sides and front are built inside a framework of 2 × 4's for sturdiness.
The inside consists of two inclining planes and a spring door. The upper plane slopes at 15 degrees and is made of 1½ inch plywood. The lower plane is a ¾ inch plywood sloping at 20 degrees, and it fits snugly to the front panel. The door of plywood is hinged by large adjustable screen-door springs to the upper plane. The front of the upper plane is separated from the front panel by slightly more than the thickness of one cassette. The microswitch (open in neutral position) is placed in the hinge side of the door, and a one inch wide strip of ¼ inch thickness of rubber is placed across the front end of the door one third of the way down. This acts as a brake to the movement of the cassettes (Fig. 2).

A small catch bin for the cassettes is placed under the lower plane. Two rubber scrub pads are all the padding required to protect the cassettes. The bin is unattached to the main apparatus to prevent jarring of the machine by the falling cassettes.

The electrical circuit (Figs. 3 and 4) utilizes a tumbler switch and a microswitch. Both switches must be closed to activate the x-ray timer. The circuit is connected to the two poles of the x-ray timer switch by means of a male-female type of plug. The closure of the two switches by-passes the hand switch of the x-ray machine.

**OPERATION OF THE MACHINE**

The patient lies with his back on the x-ray table and the head on a padded Mayo table. The cassettes are loaded in the machine, one directly behind the masonite, and the others on their sides in the upper inclining plane. The cassettes are held in position by the spring door and a movable wedge that slides freely in the upper plane. Under pentothal® anesthesia the internal carotid artery is injected percutaneously with 6–8 cc. 35 per cent diodrast®, and at a signal from the operator the first exposure is made by closing the toggle switch. The remainder of the exposures are made by opening the door with the pull-cord and its closure by the springs. At each door closing the microswitch activates the X-ray timer and another exposure is made.

Exposure factors are: 36 inches distance; 70 KV; 1/80 to 1/10 of a second; 200 MA; stationary grid. It is necessary to use the interval timer to obtain exposures in one second or less intervals for the impulse timer will not be activated properly with a short break in the contact by this electrical circuit.

Certain limitations and disadvantages are inherent in the operation of this machine. There is obviously considerable noise accompanying the closing of the spring door, but the patients are asleep and are not aware of such disturbances. Lateral views only are obtained, but these are stereoscopic views and anteroposterior views are easily taken by placing the cassette under the head. A small amount of dexterity by the technician is required, but this can easily be obtained by practice. The few disadvantages are outweighed by the simplicity of the operation, low construction cost (§20 to §25) and the adaptability provided.

**SUMMARY**

An inexpensive apparatus for obtaining multiple serial radiographs is presented and its construction is described. The mechanism is simple and easy to operate so that one technician may accomplish the exposures with confidence.

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