Complications in the Use of Temporary Intracranial Arterial Clip

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The temporary arterial spring clip designed by Dr. Frank Mayfield of Cincinnati* has been distributed widely among neurosurgeons. Although it has not been described formally in the scientific literature, frequent mention of it in publications on the surgery of intracranial aneurysms attests to the usefulness of this instrument.1,2

The value of the clip is affected in no way by the complications described here; however, a warning is given that others may avoid the same difficulty in utilizing this ingenious device.

The spring clip illustrated in Fig. 1 is given to the surgeon in the operating room with the Mayfield forceps, the clip being in the open position. The clip can be slipped over a vessel and the vessel occluded by forcing the forceps together slightly, then releasing the forceps. Reversal of this procedure will remove the clip easily.

If, in his effort to place a clip on a vessel, the surgeon places the clip too snugly, the scissors-like action of the shank of the clip may lacerate the arterial wall (Fig. 2A). The damage is not evident until the temporary clip for occlusion is removed, at which time a spurt of arterial blood from the point of occlusion makes it all too clear (Fig. 2B). This has happened on two separate occasions when an assistant, seeking to make certain that the clip was placed firmly on the internal carotid artery proximal to the origin of the posterior communicating artery, lacerated the wall of the vessel as described above. In each instance, the aneurysm distal to the temporary clip had been ligated successfully, and the opening in the wall of the internal carotid artery seen on removal of the clip created a potentially catastrophic situation.

A second previously unreported complication has been brought forcibly to the attention of the authors in the case of a 56-year-old man who had a

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Fig. 1. (A) Diagram of Mayfield clip forceps and clip being placed too snugly on the vessel. (B) The scissors-like action of the clip has lacerated the wall of the vessel.

Fig. 2. (A) Segment of intracranial portion of internal carotid artery removed at routine autopsy, clip being placed on artery as shown in Fig. 1. (B) Vessel cannulated with polyethylene tube, clamped distally, and irrigated with saline solution. Stream of fluid simulates that seen at operation when vessel has been lacerated.

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* Manufactured by Kees Surgical Specialty Co., Alexandria, Kentucky.
single episode of spontaneous subarachnoid hemorrhage on the left side. An arteriogram disclosed a large aneurysm at the trifurcation of the left middle cerebral artery (Fig. 3). The patient was operated upon under hypothermia at 28.5°C., and the aneurysm ruptured when it was exposed. To control the bleeding a Mayfield clip was placed on the internal carotid artery just proximal to the posterior communicating artery. At that time, the wall of this artery appeared to be normal.

During the controlled period of clipping, the aneurysm was coated with an artificial latex of polyvinyl-polyvinylidene chloride copolymer and an epoxy-polyamide, 2-component resin, according to the technic described by Selverstone et al.3,4 The total time of occlusion was 18 minutes.

Postoperatively the patient did well but had some residual headache; repeated angiography was done 41/2 months later on the left side. This showed the rather indistinct shadow of the epoxy resin coating the aneurysm, but beneath this and at the point where the Mayfield clip had been placed there was a distinct wide-based aneurysm of the internal carotid artery.

Although no further investigation has been carried out, it is assumed that this aneurysmal dilatation was the result of damage to the arterial wall which occurred during the process of occlusion by the Mayfield clip.

Fig. 4. Modified Mayfield clip with hiatus between jaws of clip to avoid scissors-like action at time of application. (A) Old clip. (B and C) Modified clip.

Dr. Mayfield and Mr. Kees, the manufacturer, have made immediate modification of the clip to prevent this complication (Fig. 4), but many neurosurgeons undoubtedly have continued and will continue to use the older clip. It may be used safely if the precaution is taken of placing it with the shank of the clip 1 mm. away from the vessel.

Summary

A description of two unusual complications in the use of the temporary intracranial arterial clip are reported: (1) Actual laceration of the wall of the intracranial artery by the scissors-like action of the Shank of the clip if placed too deeply on the artery, and (2) possible damage by the clip to the arterial wall itself, producing subsequent arterial dilatation or aneurysmal formation at the point of clipping.

In spite of the complications reported, the temporary intracranial arterial clip is considered to be an essential and important adjunct to aneurysmal surgery.

References