40. Neurosurgical Experiences under Total Circulatory Arrest with Profound Hypothermia using Extracorporeal Circulation

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In the surgical department of Osaka University, four cases of neurosurgical patients were treated under total circulatory arrest with profound hypothermia using extracorporeal circulation from July 1965 to June 1966. Two of the cases with highly vascularized gross meningiomas were operated with an open-chest technique, and the other two cases with an aneurysm and an arterio-venous malformation respectively with a closed-chest technique.

Case K.T. was cooled to 30° C rectally on a cooling blanket and then to about 15° C with perfusion. Two venous canulas were inserted into the superior and inferior caval veins through the right atrium, and another in the left ventricle to decompress the left side of the heart. An arterial canula was placed in the femoral artery. The perfusion was first done under the flow rate of 2.0 l/m²/min. and then about 0.5 l/m²/min. after the rectal temperature reached about 15° C. The tumour was resected piece by piece carefully and totally extirpated under the low flow perfusion and total circulatory arrest. But a massive and almost uncontrollable bleeding, mainly from the meningeal attachment to the falx cerebri, occurred after the perfusion was reopened, partly because of the insufficient electrocoagulation and clipping and partly the fibrinolytic phenomenon. The bleeding was controlled about four hours after the blood was neutralized with protamine. Postoperatively she was semicomatous with severe thrombocopenia and hemorrhagic diathesis. She died on the 21st postoperative day. Death was believed due to the intracranial bleeding but an autopsy was not done.

In Case Y.S. two venous canulas were inserted into the inferior caval vein through each external iliac vein, one of which into the right atrium and the other in the middle of the inferior caval vein, and an arterial one in the external iliac artery. After the surface cooling the patient was perfused under a flow rate of

Table 1.

Case Sex Age	Diagnosis	Operation	Opern- on Closed- Chest	Perfusion Time (Min.)	The Lowest Temperature (°C)	Total Circulatory Arrest (Min.)
S.K. f. 36	falx- meningioma	extirp.	open	211	esophagus 12.0 rectum 14.0	20
K.T. f. 37	falx- meningioma	extirp.	open	241	esophagus 12.0 rectum 15.0	55
S. f. 32	aneurysm of 1. mid. cereb. art.	ligation	closed	177	esophague 10.0 rectum 12.0	7
H.N. f. 23	A-V- malforma. of 1. cereb. hemisph.	extirp.	closed	160	esophague 9.0 rectum 18.0	6

1.6 l/m²/min. and then a low flow rate after about 15° C rectally. The neck of the aneurysm was easily tied off during the circulatory arrest of 7 minutes. The postoperative course has been uneventful.

The extirpation of the vascular malformation of Case H.N. was easily done with a closed-chst technique. But it was a serious experience that pulmonary edema was observed directly after the perfusion was reopened. The patient was deeply comatous postoperatively and increased intracranial pressure and pulmonary edema were repeatedly observed. She died on the third postoperative day and an autopsy revealed marked edema and stasis in her lungs. The reasons for this pulmonary edema have been left unclarified but the overdistension of the left side of the heart due to the absence of decompressing canal in the left ventricle was suspected to be one of the factors.