NEURO-IMAGE

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SYNAPSE-50

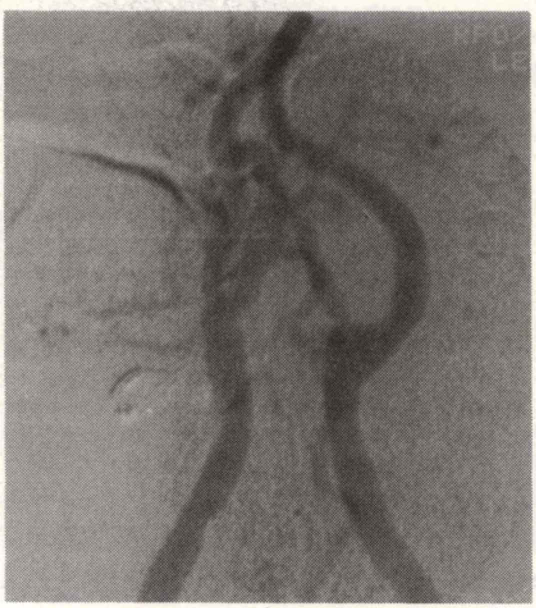
L'ANGIOSCOPIE DES VAISSEAUX DU COU

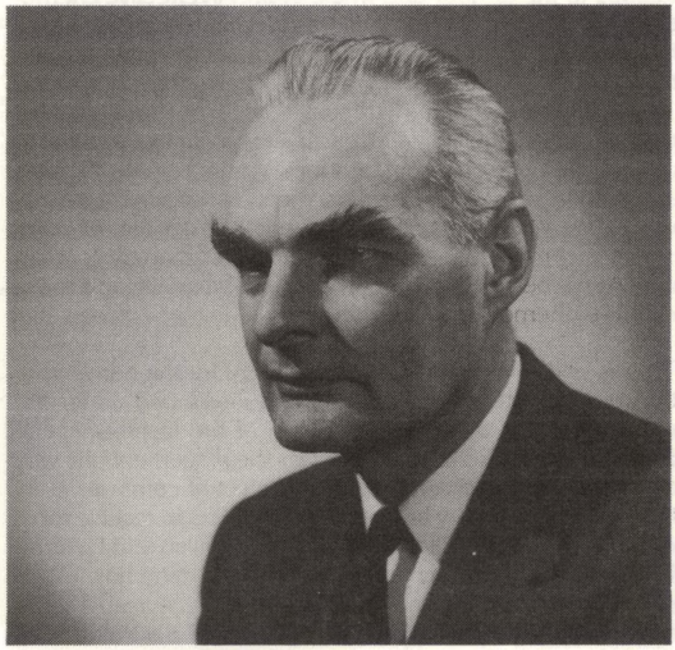
Jacques Théron, m.d.

Tous ceux qui pratiquent des opacifications des vaisseaux du cou connaissent les mêmes difficultés au moment de la lecture des clichés. Cette sténose de la carotide interne est-elle ulcérée? Pourquoi le déficit transitoire de ce malade est-il survenu du côté de la sténose la moins importante lorsque les deux carotides sont pathologiques?

Toutes ces questions restent habituellement sans réponse car l'angiographie seule ne peut y répondre. Il faut en savoir plus, il faut pouvoir voir à l'intérieur du vaisseau et apprécier la morphologie d'une plaque athéromateuse, pouvoir dire si elle est lisse, irrégulière, ulcérée. Le service de radiologie de l'Institut Neurologique va très prochainement être équipé d'un fibroscope suffisamment long pour être introduit par voie fémorale et suffisamment fin pour pouvoir être glissé à l'intérieur d'un cathéter (1,8 mm).

Nous comptons pouvoir très prochainement fournir des images in vivo de l'intérieur des vaisseaux du cou et aider ainsi à répondre à toutes ces questions que nous nous posons.





Donald L. McRae, 1912-1982

NEURO IMAGE

Roméo Éthier, m.d.

Neuro Image est le Bulletin du «McRae Research Fund». Il est publié sur une base régulière par le département d'Imaging de l'Hôpital Neurologique de Montréal, pour renseigner sur ses activités cliniques, didactiques et scientifiques.

Il veut donner un aperçu ponctuel de l'imagerie en neurologie, de certaines de ses applications, de son utilité, de ses complications, bref de faire connaître toutes les facettes de l'exercice de la neuroradiologie.

Il veut ainsi honorer la mémoire de feu Donald L. McRae dont l'activité professionnelle en ce domaine a été marquante pendant près de 25 ans. Il rend aussi hommage à tous ceux qui lui furent associés et qui lui ont succédé dans l'exercice de cette discipline d'avant-garde de la médecine.

On the occasion of the 50th Anniversary, Neuro Image wants to be part of the celebration and from then to make a new start.

SUPERSELECTIVE CEREBRAL CATHETERIZATION FOR INTRATUMOURAL CHEMOTHERAPY

C. Worthington, m.d., J. Tyler, m.d.
et la collaboration de: J.G. Villemure, m.d., J. Théron, m.d., L. Yammamoto, m.d.

The poor prognosis associated with malignant primary brain tumours (astrocytomas Grade 3 and 4, glioblastoma multiforme and their variants) is well known, and treatment for such lesions is a difficult affair. In general, craniotomy is performed for tissue diagnosis and tumour debulking with the aim of preserving as much of the patient's intact neurological function as possible. This is followed by radiation therapy to the tumour and whole brain. An effective chemotherapy for primary brain tumours has yet to be developed. However, the most promising class of agents used to date has been the nitrosoureas and of these the compound 1,3-bis (2 Chloroethyl) 1-Nitrosourea or BCNU has appeared to have the greatest effect. It has been shown that survival in patients with primary brain tumours is more prolonged when a combination of surgery, radiation, or chemotherapy is used than when a single one of these modalities is used alone. A combination of all three modes of therapy appears to have the best results. The task at hand is to develop a more effective chemotherapeutic protocol.

To this end, a multidisciplinary protocol for the administration of intra-arterial BCNU has been developed under the auspices of Dr. Jean-Guy Villemure of the Department of Neurosurgery. This therapy involves the placement of a very small angiographic catheter into a selected cerebral vessel from which a primary brain tumour appears to receive most of its blood supply. Radioactive BCNU is given and Positron Emission Tomography performed to determine how much of the chemotherapeutic agent is being taken up by the tumour. Finally, a therapeutic dose of BCNU is administered via the previously placed catheter. In this initial project, 30 patients will be studied and the results analyzed, with the aim of continuing, should good results be obtained. Patients who are appropriate for the protocol are those who have had a biopsy-proven malignant primary brain tumours (astrocytoma Grade 3, astrocytoma Grade 4, glioblastoma multiforme, or mixed malignant tumour), who have had maximal surgical resection and who have had a full course of radiation therapy.

The procedure is dependant upon the ability to manipulate a small catheter selectively into intracerebral arteries. Dr. Jacques Théron of the Dept. of Neuroradiology has refined this technique, which is aimed at directing the catheter to the most appropriate intracerebral vessel supplying a maximal amount of tumour and a minimal amount of normal brain. Initially, the C.T. scan is examined to determine the arterial distribution of the tumour. Following this a standard selective internal carotid angiogram is evaluated to determine how difficult a superselective catheterization will be, due to the tortuosity of the internal carotid artery, and variations in the caliber of intracerebral vessels secondary to spasm and other abnormalities related to the presence of the tumour. The angiogram is also evaluated to determine which vessels appear to be the principle supplying vessels to the lesion.

The superselective catheterization procedure is carried out under neurolept anesthesia in the Digital Angiography Suite. Using the standard Seldinger technique the femoral artery is cannulated and a preshaped 5 French radiographic catheter is manipulated under fluoroscopic control into the appropriate carotid artery. Once this is done the catheter is exchanged over a guide wire for a 7 French straight internal carotid catheter, which is positioned at the C1-C2 level and serves as a guiding catheter. This 7 French catheter is then connected to a propulsion apparatus (Figure 1), which is designed to direct a small 2 French catheter through the guiding catheter into the intracerebral vessel. The propulsion chamber is filled with heparinized saline and has valves at either end, and a side port with a stopcock through which an injection can be made. A number 2 French silastic catheter has a small balloon at its tip. In this flow directed technique, filling the balloon with a small amount of saline or contrast adds a little extra weight and helps carry the balloon into the internal carotid circulation. In addition, with contrast in the balloon, the position of the catheter can be determined at any time with fluoroscopy. To propulse the small catheter into the intracerebral circulation, the distal valve is initially closed off and the small catheter is fed into the propulsion chamber loosely. At this point the proximal valve is closed off so that no fluid can escape, the distal catheter is opened and using a quick bolus injection in the side port, the small catheter is propulsed cephalad with the bolus of heparinized saline. It is sent up the guiding catheter into the intracerebral branches of the internal carotid artery. Figure 2 shows an angiogram performed after completion of a superselective catheterization of a middle cerebral vessel.

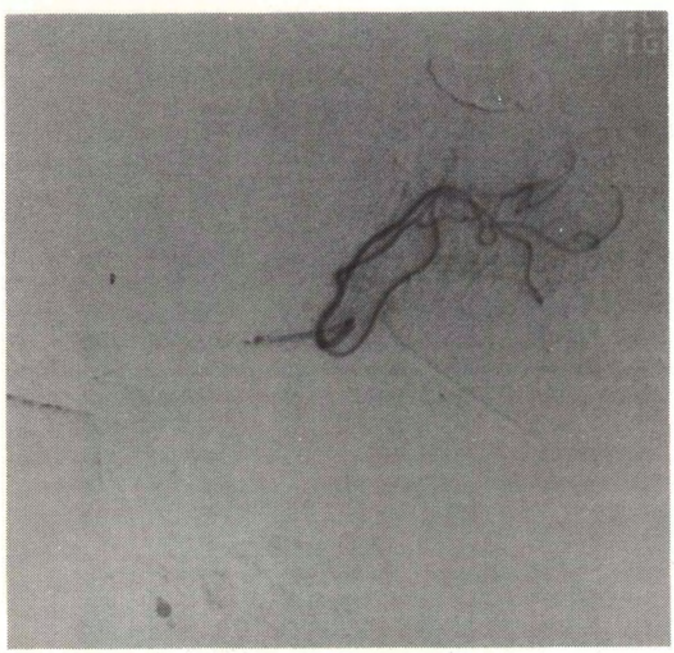
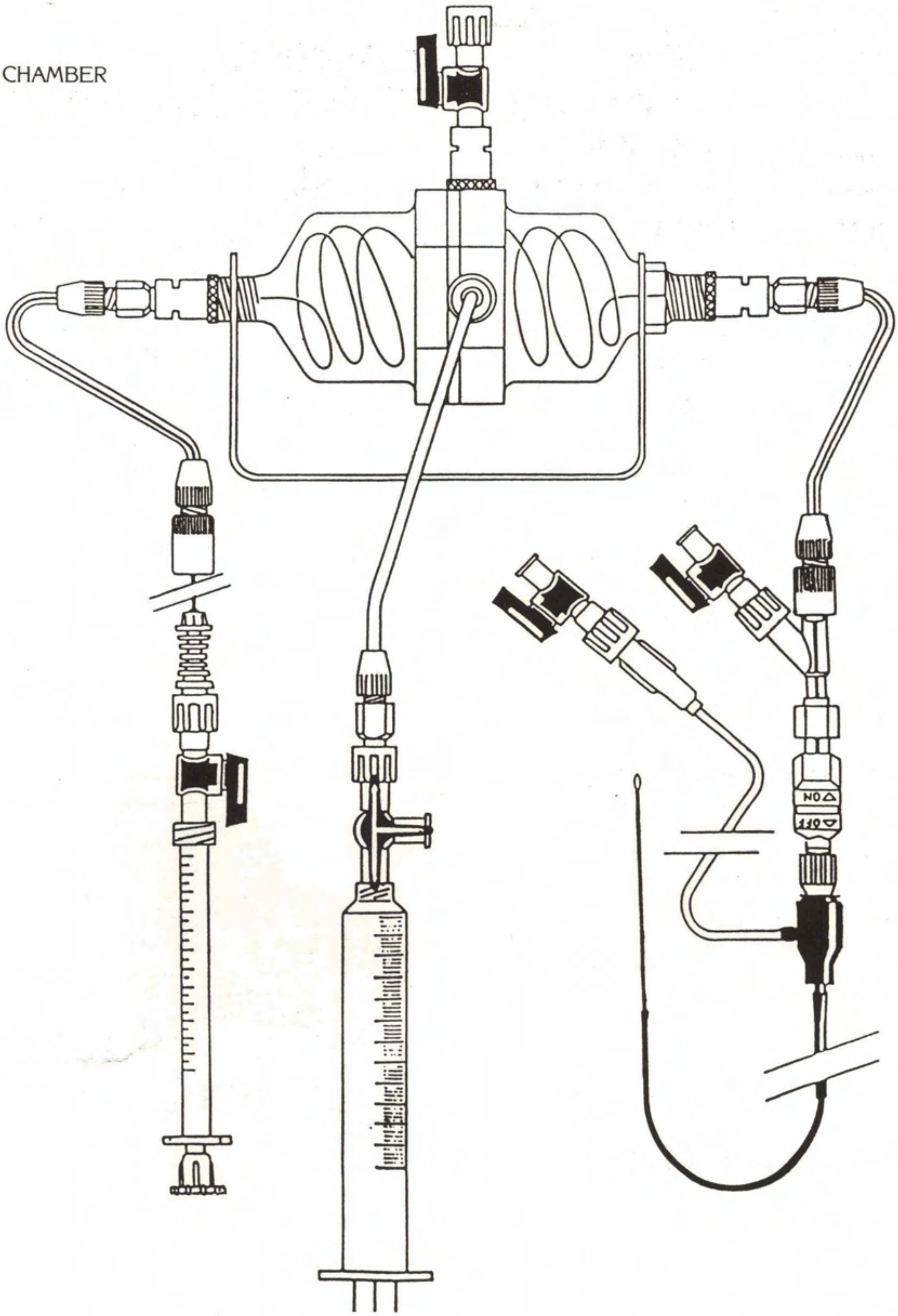


Figure 2

Figure 1
PROPULSION CHAMBER



Once the catheter is in position, the patient is transferred to the Department of Neuro-isotopes. There, Dr. Lucas Yammamoto and Dr. Jane L. Tyler inject isotopic labelled BCNU via the superselective catheter. Positron Emission Tomography is then performed. The scan obtained is compared with a scan performed on another day in which labelled BCNU is injected intravenously. In comparing the two scans, a determination can be made regarding the degree of tumour uptake of the BCNU as compared to normal brain, and a determination can be made as to the amount of BCNU which is reaching the tumour on the first pass via the arterial injection. Initial results would indicate that a much higher concentration of BCNU reaches the tumour with intra-arterial injection than would be expected with intravenous injection.

Finally, the patient receives a therapeutic dose of BCNU via the superselective catheter. A dose of approximately 300 mgs is given by infusion pump over a period of 2½ to 3 hours.

It is hoped that this new method of intra-arterial chemotherapy, which is dependant upon the radiological technique of superselective catheterization, will prove to be a useful adjunct in the treatment of malignant primary brain tumours.

Fonds de recherche McRae Institut Neurologique de Montréal

Les collègues et amis qui ont connu Donald L. McRae peuvent, en faisant un don, témoigner de leur reconnaissance pour son influence et son enseignement dans le domaine de la Neuroradiologie.

Les sommes recueillies serviront à la promotion de l'enseignement en Neuroradiologie, au développement de nouvelles techniques et à l'organisation des conférences McRae consacrées à l'imagerie Neurologique.

McRae Research Fund Montreal Neurological Institute

Friends and colleagues of Donald L. McRae may wish to show their gratitude for his influence and teaching in the field of Neuroradiology.

The proceeds of this fund will be used to promote education in this field, specifically, to develop new techniques in Interventional Radiology and to support the McRae Lecture in Neuro-Imaging.

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MAGNETIC RESONANCE IMAGING

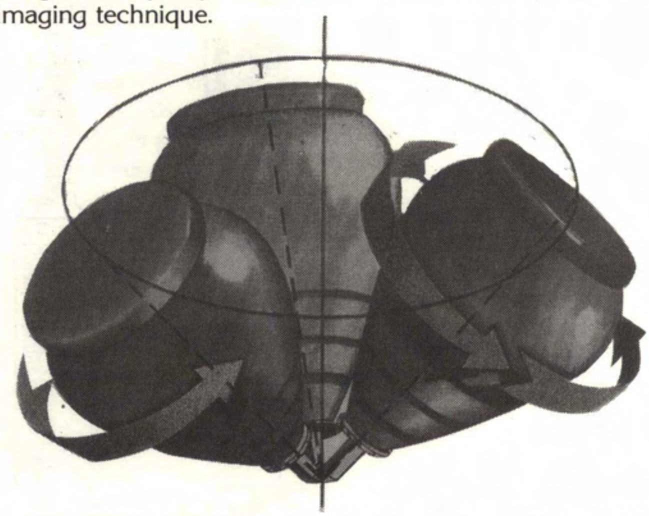
T.M. Peters Ph.D.

Montreal Neurological Institute.

Before the end of the year, the Montreal Neurological Institute will be catapulted into a new era of Neuro-Imaging with the acquisition of Canada's first high-field in-vivo Magnetic Resonance Imaging unit.

We are currently proceeding with the installation of a Philips Gyroscan S-15 imaging system comprising a large tubular superconducting magnet, and all of the associated electronic and computer hardware necessary for its operation.

Magnetic Resonance Imaging units, although generally located within radiology departments, do not rely on ionizing radiation for their operation. Instead they utilize the phenomenon of Nuclear Magnetic Resonance which is observed when the hydrogen nuclei making up much of the body water and tissue are subjected to an intense magnetic field. These nuclei may be excited into a precessional or wobbling motion by means of externally applied radio waves. These nuclei in turn generate their own radio waves which are received by an antenna built into the magnet. A powerful computer interprets these signals and processes them into images of a quality which cannot be matched by any other imaging technique.



Computed tomography, a technique which we have used for the last 10 years, has provided an enormous boost to radiological diagnosis. Magnetic Resonance Imaging builds on this success and offers a number of distinct advantages.

1. The tomographic images may be made at any desired orientation in any part of the body.
2. Because it does not use X-rays, there is no radiation related risk from an M.R. exam.
3. It can detect changes in tissue composition with much greater sensitivity than C.T., and can also measure blood flow.
4. M.R. images are not affected by the presence of bone as are some C.T. images.
5. Most studies may be performed without the need for contrast agents.
6. Data acquisition is entirely electronic and there are no moving parts or complex radiation sectors to break down.