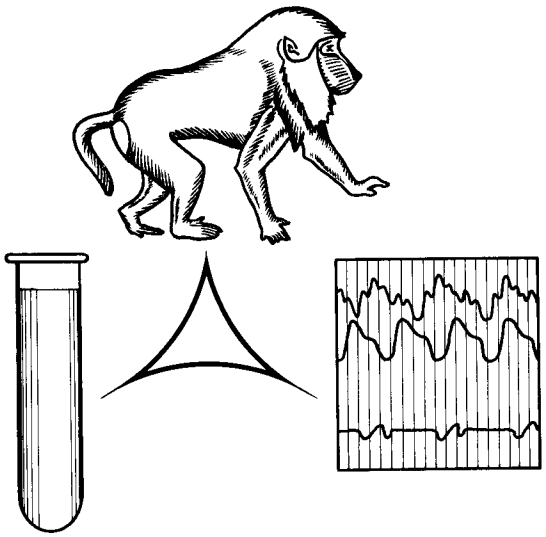

Research Notes

"An Afternoon in the Library"

A rare treat to be savored is finding the occasional afternoon to spend in the confines of the medical library wandering through the periodicals and journals, perusing the articles that strike one's fancy. One such afternoon turned up a series of papers in the realm of isolated organ perfusion—the purpose of the various preparations being to treat acute hepatic coma rather than the storage of an organ.

One article[1] dealt with the use of isolated pig livers, flushed with a Ringer's lactate and heparin solution, and placed in an extracorporeal perfusion circuit. Blood drains from an artery of the patient and is conducted through a heat exchanger, the isolated liver, a reservoir, and a filter at which point it is returned to the patient, via a vein, by a roller pump. A bubble oxygenator, placed as a shunt between the arterial and venous patient connections, oxygenates the whole blood prime until the patient is ready then is slowly weaned from the circuit.

A similar study[6] using a baboon, flushed with Ringer's lactate under hypothermia, and primed with whole blood (human), in a cross-circulation preparation with a man gave good results[7] in a clinical trial as did the pig liver preparation. The extra-corporeal circuit used in the baboon involved the use of two bubble oxygenators in a more complex set-up.

Another treatise describes an experiment utilizing hyperbaric oxygenation to effectively increase the length of time the Inferior Vena Cava may be safely occluded. It was performed with an eye to possible clinical applications in the areas of controlled hypertension and chemotherapy for liver metastases. Illustrating in detail the physiology involved, an increase from four to six times the safe time under non-hyperbaric conditions was achieved.[2]

Stirred by the controversy of whether or not to perfuse the coronaries during intra-cardiac surgery, the authors of another article felt a need for re-examining the effects of anoxic arrest and instituted extra-corporeal circulation on two groups of animals for an hour. One group had the aorta cross-clamped for forty-five minutes of this time while the others did not. Their study of various physiologic parameters showed that function of the left ventricle was depressed in both groups but was markedly so in the anoxic group.[3]

Most research projects are limited to available instrumentation but, in some cases, the instrumentation is devised or invented to implement the project at hand. One of these ingenous devices is an implantable tension gauge[5] for the myocardial wall. The unit is linear in its response to longitudinal stress and the pericardium can be closed over it like a myocardial pacemaker electrode.

One problem that still faces the surgeon is the storage of organs. The primary concern, no matter how long the organ is stored, is that the organ function when it is transplanted. A rising perfusion pressure followed by tissue edema has been seen in isolated perfused organs. A study[8] has found that fat embolization is the culprit when whole blood or plasma is used as the perfusate. Tissue hypoxia is produced when these aggregates plug the vessels in the organ resulting in tissue edema and cell death. Serial micro-filtration of the perfusate removes these aggregates and eliminates, therefore, the rise in perfusion pressure. The organ is stored in a transportable perfusion circuit which utilizes a membrane oxygenator, pulsatile pump, and hypothermia.

It was a pleasure to run across a paper by an old friend. Dr. Akutsu spoke before the Society in May of 1966 in Washington, D.C. His work concerns the application of a new in-series left heart support device—the novel feature is an inflating tube-type outlet valve while the heart's aortic valve acts as an inlet valve. A rapid method of insertion was developed so implantation could be effected without the use of a pump-oxygenator system. The unit consistently produced complete atrialization of the left ventricle (using the heart's ventricle as a chamber whose function is to fill—like an atrium—the artificial ventricle).[4]

References

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[8] Belzer, F. O., et al; San Francisco California; "Rising Perfusion Pressure in Isolated Organ Perfusion"; Annals of Surgery; September, 1968; Volume 168, No. 3.