

The Beginnings of Indocyanine Green Angiography

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(This is a communication from Earl A. Choromokos and Noble J. David to Johnny Justice, Jr.)

Our best recollections of the beginnings of ICG angiography go back to mid 1968 at the University of Miami Medical School. Earl was working with Dr. Kyuya Kogure, a neurologist studying cerebral circulation and was requested to perform fluorescein angiography of the superficial brain vasculature. During one of these experiments and while waiting for the brain surface to be exposed, Earl noticed a box labeled Cardin-Green. He opened the box and read the accompanying literature and found that this dye is used to study the hemodynamics of circulation. The spectral analysis of the product mentioned its high absorption in the upper wavelengths.

Earl suggested to Dr. Kogure, "Let's try this dye after we complete our planned experiments". We used Kodak Ektachrome and their infrared color film during the first experiment. During the transit of the dye we did not observe any flow of the dye and frankly thought that we had wasted our time.

When the films were returned to us from the outside color lab the next day, one of them was a dramatic ICG angiogram of the brain vasculature. After our initial shock, we had to figure out which techniques we actually used during this experiment. Earl's next suggestion was to do an angiogram of the retina.

The following day, the three of us discussed our findings and agreed that

we should try this technique with owl monkeys. Later, we anesthetized a monkey and cannulated a branch of femoral vein and injected 5cc of the ICG dye. We reviewed the angiogram the following day and were thrilled with the successful results.

During the next month, we repeated our technique several times with varying amounts of dye. After compiling our data, we had a meeting with Dr. Edward W.D. Norton, Professor and Chairman of the Bascom Palmer Eye Institute. Dr. Norton was excited with our results and said that this was the first time that he had seen the choroidal circulation in vivo. At his sugges-



Figure 1 a: Earl Choromokos using the special vertically mounted Zeiss fundus camera, with Dr. Kyuya Kogure and a neurology fellow, 1968.

Figure 1 b: single frame of an ICG angiogram on an owl monkey.



Figure 2: Earl A. Choromokos, COPRA, now a professor of Ophthalmology at the University of Cincinnati, 1994.

tion, we applied for a grant to do human studies.

One of Earl's duties required transporting the "rigged" overhead Zeiss fundus camera from the research laboratory at the Bascom Palmer Eye Institute to the Radiation Department at the VA Hospital to perform retinal angiograms on patients following carotid arteriography. We decided to try an ICG retinal angiogram while injecting ICG dye into the carotid artery at our next scheduled session at this lab. Although the

method was clumsy and involved carotid arteriography, the results were very successful. Again we showed our results to Dr. Norton and he was ecstatic but felt that for this technique to be useful from a clinical standpoint it had to produce useful results with an intravenous injection rather than the more invasive carotid technique.

The following week we attempted an intravenous ICG angiogram on a volunteer patient without favorable results. We continued experimenting with this technique for the rest of 1968 and a portion of 1969 and then decided that this research would not produce useful results in humans due to present technologic limitations. We are delighted that there has been a rebirth of interest in this exciting modality.

REFERENCES

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