

EDITORIAL

ON THE PRACTICE OF BASIC AND CLINICAL HEMORHEOLOGY AT BLOOD TRANSFUSION CENTERS

Basic and clinical hemorheology is more and more being practiced in hospitals and research institutions associated in particular with medical schools in many countries. Efforts are being made on a world-wide basis in establishing hemorheological investigations and testing procedures as an aid in the practice of medicine and surgery. However, the numerous blood transfusion centers and blood transfusionists in different parts of the globe appear to be unaware of the existence of hemorheology and of its significance for the practice of the transfusion of blood and of its cellular and plasmatic components.

The Readers of BIORHEOLOGY, in particular those working in hemorheology, will be interested in my opening remarks which I gave as Président d'Honneur of the European Symposium Hemorheology and Diseases (Hémorhéologie et Pathologie) held 17.-19. October 1979 in Nancy, France. An excerpt of my address at the opening ceremony of this international conference follows:

"It is very gratifying to see the growing interest in hemorheology among researchers from different disciplines. This interest stems from many important studies during the past thirty years and, in particular, during the past decade. I believe, we are merely, so-to-speak, "at the tip of the iceberg" in exploring hemorheology. In likening hemorheology to inquiries about other natural phenomena, we could picture explorations of a jungle with its many plants, branches, twigs and leaves. Corrective examinations of such a tangled vegetation would make it more accessible to scientific exploration. In hemorheology we have passed such similar preliminary investigations. With the aid of tools, including those from other disciplines, and, what we need to be aware of, within the limitations of our insights, we can begin to do more than pruning the "jungle" of the flow of blood and its relations to vessel walls.

As you well know, hemorheology is a term for a science branch of biorheology which deals not merely with the rheology, that is, the flow properties and deformation of blood, but as well with the rheology of the vessel wall, viz., of all the structures with which the flowing blood and any of its components come into direct contact.

We all are well aware that hemorheology is not limited to the circulation of the blood in a mammalian organism, but concerns also any other classes of animals which are endowed with blood, contained and circulating within a cardio-vascular system. However, what this symposium will deal with is the mammalian organism, with special emphasis on the human species and its pathology.

It is particularly encouraging that quite a number of diseases and other pathological conditions benefit already from the advancement of knowledge in hemorheology. This is a development which is bound to affect human health and many pathological conditions in patients, in which the blood and the blood vessel wall are involved. There can hardly be any doubt that the new knowledge will be of direct aid to the diagnosis, therapy and prognosis of many diseases

and other pathological conditions. Hemorheology will also become increasingly important in the prevention of diseases and thus counter the threat to health and fight disease processes which may either cripple or lead to death.

Although many among us researchers here at this symposium are not involved in directly aiding or treating patients, it goes without saying that advancement of fundamental knowledge in hemorheology is most important for better understanding the physiology of the blood circulation towards more effective prevention and treatment of human disease. Advancement of knowledge of the flow properties of blood and many of its constituents is therefore essential. This is also true for the exchanges between the blood and the tissues, as well as with regard to the physical and chemical processes which are involved.

The organizers of this symposium have wisely chosen to invite contributions which will be presented in sessions dealing with theory, models, methodology, pathology, pharmacology and therapy.

You will probably be surprised in my referring to my previous journey in Europe, where six weeks ago I visited with my old friend Professor van Loghem in Amsterdam. He showed me the Central Laboratory of the Netherlands Red Cross Blood Transfusion Service which he directed until last year. I know Professor van Loghem since my first visit to Amsterdam in 1948, when we met in his small laboratory for blood group research, which he founded three years earlier. He expanded his laboratory of immuno-hematology over the years into a blood transfusion center, where now about 1,000 people work, including many who are engaged in scientific research in about fifteen departments.

I am mentioning this recent visit of mine for several reasons in association with the practice of hemorheology. As the flow of blood, so is the flow of a suspension of isolated platelets a rheological phenomenon. Following the transfusion of platelets, the hemorheological behavior of the circulating blood is altered. Platelet transfusions are increasingly being given therapeutically in a number of pathological conditions with often highly beneficial results to the patient. In this connection, I should like to acquaint you with the following story.

On my first post-war visit in Europe after participating in the First International Congress on Rheology at Scheveningen, Holland in 1948, I met also in Amsterdam the late Professor van Creveld, the pediatrician. He enthusiastically told me about the historical event of the first transfusion of platelets which was given to a patient of his who suffered of thrombocytopenic purpura. What pleased me was that a child benefited from this historical transfusion and that the method of the isolation of platelets, employed in Dr. van Loghem's laboratory, was developed by me together with my associate Dr. Houlihan in 1944 in my laboratory at the University of Virginia School of Medicine at Charlottesville. It was a cumbersome method which, I am glad, could be replaced by less laborious and even elegant ones.

When last month Professor van Loghem showed me the large blood transfusion center, I had to tell him that I am missing a very important activity, namely, a laboratory, if not a department, of hemorheology. In my appraisal,

a blood transfusion center anywhere must have a research laboratory of hemorheology, as well as a hemorheology laboratory for routine testing of blood samples. In any hospital in the world, where blood transfusions are performed, the blood is tested for blood groups and other factors. It is very clear to everyone, including the lay public, that these are immunological tests for compatibility. However, it did not occur thus far to the medical profession in general and especially to many blood transfusionists that what they are dealing with are hemorheological phenomena on an immunological basis, namely, agglutination or the irreversible clumping of red blood cells, and hemolysis. It is not yet general knowledge, what we all here assembled take for granted, that there can be hemorheological phenomena on a non-immunological basis, which can lead following blood transfusion to disturbances in the circulation. As I pointed out to my friend van Loghem, there is a need for hemorheological studies and routine testing in a blood transfusion center, such as the one in Holland, and I reasserted my belief in such a necessity, when I was introduced to the new director of this large institution in Amsterdam.

I know that such hemorheology laboratories do not exist, for instance, as part of the New York Blood Center in the city, where I am residing, nor with the Blood Service of the American Red Cross in Washington, D.C. To my knowledge, the only blood transfusion center in the world, where hemorheological testing and research in hemorheology are being made, is here at the Centre Regional de Transfusion Sanguine et d'Hématologie. I am glad to say that both fundamental and clinical hemorheological research is being pursued here vigorously and with great enthusiasm. I, therefore, salute Professors Streiff, Larcan and Stoltz who had the foresight to include the practice of hemorheology as an integral activity of the transfusion center here at Nancy. The question may be asked, what kind of routine hemorheological testing can be done in a blood transfusion center? As I have been told yesterday by Dr. Stoltz, the following routine procedures are being employed here at the transfusion center: measurements of viscosity and viscoelasticity of blood and plasma, different filtration tests, and also electrophoresis tests of red blood cells and platelets. Since many hemorheological research studies are being made here, it can be expected that, as a result, several tests employed in these studies will then be applied as routine hemorheological tests for blood transfusion. It goes without saying that for routine hemorheological testing, measuring techniques and methods developed in other laboratories should be included as far as is feasible or practical, but deemed necessary in preventive medicine and for clinical considerations.

I should like to emphasize that the practice of hemorheology is not merely imperative in any blood transfusion center, but also in any hospital and clinical laboratory, as part of the armamentarium in providing needed information to physicians and surgeons everywhere, for the betterment of medical care."

Alfred L. Copley

Laboratory of Biorheology  
Polytechnic Institute of New York  
Brooklyn, New York 11201, U.S.A.