38) Observation of Retinal Vasculature of Spontaneously Hypertensive Rat (SHR) by Intravenously Injected Gelatin-Fluorescein Preparation Technique. Tadashi Mikami, Hiroshi Yoshimoto and Shuichi Matsuyama. Department of Ophthalmology, Hirosaki University School of Medicine, Hirosaki-shi 036.

Fundus fluorescein angiography (FAG) is a useful method for studying blood circulatory or vascular diseases in the retina and choroid. It has been therefore, applied to the study of retino-choroidal vascular changes in human and animals. However, it is not always so easy to obtain fluorescein angiographs of high quality in rat, because of specific differences in optical condition or circulatory characteristics between human and rat on the anatomical basis. The authors, therefore, tried to develop a new technique useful for more precise study of vascular and circulatory changes in rat using a solution of gelatin-fluorescein mixture.

Animals used were Wistar-Kyoto rats (WKY) and Spontaneously Hypertensive rats (SHR). Ocular fundi of the animals were examined by ophthalmoscopy and ordinary as well as fluorescein fundus photography, prior to the following procedure. All animals were anesthetized by ether inhalation during the experiments. The eyeballs were enucleated 2 min. after 0.1 ml of the mixture of 10 % gelatin and 10 % fluorescein sodium (8:2 volume ratio) was injected in one-shot via the tail vein. The eyeballs thus obtained were fixed in 2 % glutar aldehyde for 3 min., then the sensory retinas were separated from the surrounding tissues keeping in the same fixative, and mounted to make a flat gelatin-fluorescein preparation (GFP). The GFP was then observed fluorescence microscopically using a vertical illuminator (Ultropak; Leitz). Some of thus observed GFPs were refixed in 2 % OsO_4 , embedded in epoxy resin (Epok 812), thin-sectioned and then observed electron microscopically. Thus the fluorescence microscopic findings of retinal vasculature in flat GFP and the electron microscopic findings of the cross section of the same material were compared.

On the fluorescence microscopy of GFP, retinal vessels were observed as a fine vascular tree of fluorescence which localized in the vascular lumen. The intraluminal column of vascular tree was clearly defined from the vessel wall both in WKY and SHR (Fig. 1 and 2). Marked caliber irregularities were often found in the retinal arterioles of elderly SHR aged more than 7 months (Fig. 1) while these findings were not found in SHR younger than 5 months of age and normotensive WKY. This finding suggested that arteriolar caliber irregularities found in elderly SHR were organic and irreversible. At the root of side-arm branching of retinal arterioles, intraluminal fluorescence was less in density (Fig. 2). This phenomenon was understood as a rheological effect of valve-like structure, which was confirmed by our previous investigation, on the blood stream at the branching. Light and electron microscopic observation on the ultrathin-sectioned vessels of GFP showed no findings suggesting artificial alteration in the vascular wall including endothelial lesions.

These results revealed that gelatin-fluorescein preparation technique is useful for the study of retinal circulation and vascular diseases in rat.

Fig.1 Retinal arteriole with marked caliber irregularities.

Fig.2 Less fluorescence at the root of the side-arm branching of retinal arteriole.