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Changes of physico-chemical properties of silicone oil associated with a retinal detachment

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The source material for our study was 23 samples of silicone oil, aspirated from the vitreous cavities of the eyes of patients after a tamponade about the rheumatogenic and traction retinal detachment. The average life of silicone oil in the eye was 3.5 months. In all cases, a 1300 cSt – viscosity Oxane silicone oil, Baush + Lomb, the UK, was used for tamponade. All samples were stabilized, resulting in colloidal systems consisting of a direct emulsion of two cross-saturated (aqueous and oily) liquid phases. The density of samples aspirated from the patients' eyes was measured at a temperature of 20.00 Â± 0.05Â°C by a pycnometric method, taking into account the adjustment for a loss of body weight in the air (0.00129 g/cm^3). The viscosity measurement method using the Ostwald capillary viscometer (at a temperature of 20.00 Â± 0.050Â°C) was used to measure the relative viscosity of samples by a three-time adjusting the viscometer for water phases against the distilled water (checking the viscosity measurement results against a 96% ethyl alcohol and acetone), and the viscometer for oil phases against a 100% dimethylpolysiloxane (checking the viscosity measuring results against glycerin). The criteria for complications were the development of proliferative vitreoretinopathy with reccurence of retinal detachment or an increase of intraocular pressure above 21 mm Hg. in the postoperative period. Depending on the density of the oil phase, patients were divided into 4 groups: Group 1- the density of the oil phase (o.p.) – less the density of distilled water and practically corresponding to the density of silicone oil (d20 = 0.9700-0.9799 g/cm^3); Group 2- the density of the o.p. – less the water density, but greater than the density of pure silicone oil (d20 = 0.9800-0.9981 g/cm^3); Group 3- the density of the o.p. – practically equal to the density of distilled water (d20 = 0.9982-1.0049 g/cm^3); and Group 4 – density of the o.p. – above the density of distilled water (d20 = 1.0050-1.0100 g/cm^3). The study revealed that the physicochemical properties, such as the density (growing and in some cases exceeding the density of distilled water) and the viscosity (significantly decreasing), were changing in most patients (with a different magnitude) in the process of tamponade and continuous presence of silicone oil in the vitreous cavity of the eye. The density of the oil phases of aspirated samples had an exponential relation to the viscosity. The number of postoperative complications such as development of proliferative vitreoretinopathy followed by formation of a recurred retinal detachment and an increase of the intraocular pressure above 21 mmHg depended on the density of a silicone bubble.

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