Age-related macular degeneration (AMD) is the leading cause of practical blindness in developed countries. AMD is one of many retinal diseases that arise from the absence and/or dysfunction of the retinal pigment epithelium (RPE). There are two main types of VPMD (wet and dry), which differ in etiopathogenesis and ophthalmological findings. To date, therapy is only possible for the wet form of AMD, where neovascularization permeating from the choroid and subsequent oozing or bleeding in the subretinal space with deterioration of rod and cone cells and other neuronal cells occurs. Neovascularization can be partially prevented by repeated intra-vitreal applications of anti-VEGF agents. Without treatment, the result is a disciform retinal scar and irreversible visual impairment. A current trend in the treatment of AMD is the attempt to introduce innovative surgical procedures that have the potential to improve severe ophthalmic morbidity, particularly in non-responders to pharmacological therapy.

The aim of this study was to evaluate the success rate and optimize a surgical procedure that allows for controlled and safe transplantation of RPE cells.

The success of transplantation of RPE cells in the form of an epithelium that acts as a selective barrier immediately after transplantation is dependent on the choice of the carrier. The optimal cell carrier allows for a firmer transplanted cell sheet and better handling of vulnerable RPE cells.

In the preoperative period, the cells to be transplanted are cultured on the chosen carrier and the finished product is implanted into the subretinal space (in our case, in a porcine model). The characteristics of the carrier (composition, thickness, dimensions and shape) had to be adapted to the implantation tools for the surgical procedure. The optimization of the carrier characteristics in relation to successful implantation was the focus of the first phase of the project. In the postoperative period, the success of the surgical procedure was evaluated by fundus-camera examination, optical coherence tomography (OCT) and histopathology.

As a result of our project, an oval-shaped nano-carrier (5.2mm x 2.1mm) was implanted in 18 live animals (29 eyes in total) with an overall success rate of 93.1%. Four cases (13.7%) had perioperative retinal detachment (in 2 cases the retina was successfully reattached, in the other 2 cases the detachment was associated with massive perioperative subretinal hemorrhage and the surgery was terminated). In 4 cases, the optical media became cloudy in the postoperative period and follow-up examination was not possible (however, histological

examination showed a healthy and reattached retina without signs of inflammation or other damage and these eyes were therefore included in the group of successful operations).

Conclusion. With the described surgical technique we are able to achieve, despite the high degree of technical difficulty of the procedure, a very high success rate. Thus, the surgical technique is relatively safe and reproducible with respect to the nature of the procedure.