Table C-11. Description of RPS study design, selection criteria, and treatment

Study	Study Design	Country/Site	Number of Patients Enrolled	Number of Patients at Final Followup	Patient Inclusion Criteria	Patient Exclusion Criteria	Treatment	Study Duration
Arevalo et al. 2015[13,14]	Retrospective case series of 8 patients with RP	Saudi Arabia: King Khaled Eye Specialist Hospital and Amsterdam	10	8	Patients who had been implanted with the Argus II device starting in February 2013	NR	Argus II implantation	1.3–2.0 years
Ho et al. 2015 and other authors[15-26] Argus II	Multicenter, single arm, unmasked prospective study with the system turned ON and OFF.	10 centers in the United States and Europe	30	29	Confirmed diagnosis of RP (in U.S.) or outer retinal degeneration (Europe), bare or no LP in both eyes, functioning ganglion cells or optic nerve, and a history of useful form vision. Age was initially >50 but later changed to 25 years in the U.S. and Switzerland and 18 years in France and U.K.	Diseases or conditions that affect retinal or optic nerve function, ocular strictures, or conditions that could prevent successful implantation, and an inability to tolerate the surgery.	Argus II implantation including core and peripheral vitrectomy. Phakic subjects had the crystalline lens removed via phacoemulsification	Subjects (excluding 3 who have been explanted) have been implanted an average of 6.2±0.9 years (range of 5.2–7.4).
Seider and Hahn 2015[27]	Retrospective case report with the system turned ON and OFF.	Duke University Eye Center	1	1	NR	NR	Argus II implantation	1 year

Table C-11. Description of RPS study design, selection criteria, and treatment (continued)

Study	Study Design	Country/Site	Number of Patients Enrolled	Number of Patients at Final Followup	Patient Inclusion Criteria	Patient Exclusion Criteria	Treatment	Study Duration
Stingl et al. 2015, 2013[28,29] Alpha IMS	International multicentered single (patient) blind prospective study in a group of 29 patients with RP or cone-rod dystrophy, with stimulator ON versus OFF comparisons presented in random order.	University of Tubingen, Germany; National University Health System, Singapore; Oxford Eye Hospital, U.K.; Katharinenhospital, Stuttgart, Germany; King's College Hospital and King's College London, U.K.; Olgahospital, Stuttgart, Germany; Semmelweis University, Hungary; Klinikum Dresden Friedrichstadt University Teaching Hospital, Germany; University of Hong Kong, Hong Kong; Oxford University Hospital, U.K.	29	29	Rod-cone or rod-cone degeneration and at least monocular blindness, meaning an inability to localize light and objects and lack of independent visual mobility in space or no LP or only an ability to distinguish light and darkness and unable to correctly localize a light source. Patients were required to have a fully developed and functioning central visual pathway with some useful vision up to age 12 years and who had learned to read and move independently. Also, electrically evoked phosphenes by corneal stimulation were a requirement. The retinal vascular still allows sufficient perfusion of inner retinal layer which was measured with fluorescein angiography.	No additional ophthalmologic disease. Patients without a clear optic media, inner retinal disease, or disease of the optic nerve were excluded. Patients with AMD were also excluded. Patients with edema or an extremely atrophic retina based on OCT were excluded. Also patients with heavily clumped pigmentation in the area to be implanted were excluded. Health conditions that would limit a patient's ability to withstand a 6- to 8-hour operation under general anesthesia, pregnancy, nursing, or age younger than 18 years or older than 78 years were excluded. No neurologic or psychiatric problems.	Subretinal implant Alpha IMS implanted in 1 eye plus cataract removal, vitrectomy, and a silicone oil tamponade. Appropriate refraction correction as needed. Explantation occurred at 1 year followup or earlier, based on the wish of the patient or device malfunction. Handheld unit allows patients to adjust contrast and brightness.	1 year

Table C-11. Description of RPS study design, selection criteria, and treatment (continued)

Study	Study Design	Country/Site	Number of Patients Enrolled	Number of Patients at Final Followup	Patient Inclusion Criteria	Patient Exclusion Criteria	Treatment	Study Duration
Ayton et al. 2014[30] Bionic Vision	1st-in-human trial with the device in the OFF position as the comparator	Australia Royal Victorian Eye and Ear Hospital	3	3	Age ≥18 years, any sex, confirmed history of other retinal degenerative disease such as RP or choroideremia, remaining VA of bare LP or less in both eyes, a functional inner retina (ganglion cells and optic nerve) as shown by ability to perceive light and/or measurable corneal electrically evoked visual response, at least 10 years of useful form vision in the worse seeing eye, willing and able to comply with study visits including preferably living within 1.5 hours of the investigational site, informed consent.	Co-existing ocular disease with the exception of mild cataract, inability to visualize the retina due to corneal or other ocular media opacities (corneal degenerations, dense cataracts, trauma, lid malposition) ocular conditions that predispose patients to eye rubbing, cognitive deficiencies including dementia or progressive neurological disease, psychiatric disorders including depression, deafness or significant hearing loss or the presence of a cochlear implant, poor general health or pregnancy that would exclude the use of a general anesthetic	Suprachoroidal retinal prosthesis without vitrectomy, patients continued with use of guide dogs. Due to a hemorrhage in the 1st implanted patient, patients 2 and 3 were also treated with Botox injections to minimize eye movements.	12 months reported in this publication, study ongoing for a total of 2 years followup

Table C-11. Description of RPS study design, selection criteria, and treatment (continued)

Study	Study Design	Country/Site	Number of Patients Enrolled	Number of Patients at Final Followup	Patient Inclusion Criteria	Patient Exclusion Criteria	Treatment	Study Duration
Rizzo et al. 2014[31] Argus II	Single center Interventional case series	Italy, Azienda Ospedaliero-Universitaria Pisana	6	5	RP, age ≥25 years, some visual memory, no electroretinographic response, residual LP, axial length between 20.5 and 26.0 mm, and reasonable expectations for the device's efficacy.	Other ocular disease that could interfere with device function or inhibit postoperative device visualization, history of cystic macular edema, pregnancy, desire to become pregnant, deafness, and uncontrollable systemic disease	Argus II following intervention protocol of Argus II feasibility study, including cataract extraction	12 months
Fujikado et al. 2011[32] Suprachoroidal Transretinal Stimulation	Case report of 2 patients with advanced RP. Their performance on a series of tests was compared with chance.	Osaka, Japan, Osaka University	2	2	NR	NR	For 5 and 7 weeks respectively, the 2 patients had a retinal prosthesis placed in the scleral pocket with the reference electrode in the vitreous cavity and they were treated with STS.	5 and 7 weeks, respectively, at which time the implant was removed
Klauke et al. 2011 and other authors[33-37] EPIRET3	Case series of 6 volunteers with RP	Aachen, Germany, Aachen University; and Essen, Germany, University of Duisburg-Essen	6	6 patients through 6-month followup; 5 through 2-year followup (1 patient died of breast cancer during the follow-up period)	18–80 years of age, RP, VA in better eye less than 1/50	Any other severe ocular disease, history of intraocular surgery except cataract, severe systemic or mental illness, other active implant, pregnancy, ability to read in childhood	EPIRET3 Implantation after removal of the lens, or if present, removal of an artificial intraocular lens and vitreous	1 month with device implanted followed by implant extraction. Followup was 6 months for efficacy and safety and 2 years for quality of life.

Table C-11. Description of RPS study design, selection criteria, and treatment (continued)

Study	Study Design	Country/Site	Number of Patients Enrolled	Number of Patients at Final Followup	Patient Inclusion Criteria	Patient Exclusion Criteria	Treatment	Study Duration
Zrenner et al. 2011[38] Alpha IMS	Proof-of-concept, pilot study. Report of last 3 volunteer patients who received the most current version of the device. Comparison was between stimulator ON and OFF presented randomly and without the patients' knowledge. 1 masked outcome assessor was used for all standardized tests.	Germany, University of Tübingen	3	3	Hereditary retinal degeneration of the outer retinal layers with the retinal vessels retaining perfusion and pigments of mild to moderate density, age 18–78 years, at least monocular blindness or visual function insufficient for navigation/ orientation, period of appropriate visual functions >12 years, and VA ≥20/400 earlier in life.	Any other ophthalmic disease with relevant effects on visual function, systemic diseases that might imply considerable risks with regard to the surgery or anesthesia, neurologic or psychiatric disease, hypersensitivity to any ingredients of the study device, pregnant, nursing, women of child bearing age not using contraception.	RPS Alpha IMS was implanted. All patients underwent cataract surgery and implantation of a posterior chamber lens in preparation for study prior to implantation in order to achieve the best possible optic media and prevent a secondary cataract due to use of silicone oil. Patients practiced using the device for 4–6 hours per day at home. Device was explanted at 4 months.	4 months

Table C-11. Description of RPS study design, selection criteria, and treatment (continued)

Study	Study Design	Country/Site	Number of Patients Enrolled	Number of Patients at Final Followup	Patient Inclusion Criteria	Patient Exclusion Criteria	Treatment	Study Duration
Chow et al 2010, Geruschat et al.[3,39] Extension study Artificial Silicon Retina (ASR)	Quasi-experimental, prospective, single-group study with the nonimplanted eye serving as the control condition; pre-operative and post-operative data were collected and compared.	U.S., Rush University Medical Center, Johns Hopkins University School of Medicine, and Central DuPage Hospital	6 (2 patients, patient number 5 and 6 from pilot study and 4 additional patients) Note for the orientation and mobility assess-ment only, 8 patients were tested (4 patients from the 1st trial and 4 from the extension study)	6	The 2 patients from the original pilot study who were able to read ETDRS. Additionally, 4 more RP patients with better VA received the implant under the expanded FDA-approved IDE protocol. All 4 of the newly enrolled patients were able to perform CGAT and ETDRS at some level.	NR	ASR microchip surgery with cataract removal in patients to facilitate viewing of the implant during surgery.	7 years

Table C-11. Description of RPS study design, selection criteria, and treatment (continued)

Study	Study Design	Country/Site	Number of Patients Enrolled	Number of Patients at Final Followup	Patient Inclusion Criteria	Patient Exclusion Criteria	Treatment	Study Duration
Chow et al. 2004[40,41] Artificial Silicon Retina (ASR)	Quasi-experimental, prospective, single-group study of patients with RP, with the nonimplanted eye serving as the control condition. Pre-operative and post-operative data were collected and compared. 1 masked investigator for the 9-sector visual field test.	U.S., Rush University Medical Center, Johns Hopkins University School of Medicine, and Central DuPage Hospital	6	6	Age ≥40 years, diagnosis of RP Patients had to have a Snellen VA of 20/800 OU or worse and/or15° or less of remaining central visual field measured by Humphrey automated perimetry (loss >10dB, size III white static, and 31.5 apostilb background illumination). Patients also had to be able to perceive electrically induced phosphenes produced by contact lens electrical stimulation.	Free of other significant eye or medical diseases such as uveitis, diabetes, glaucoma, cystoid macular edema, or cardiac conditions. Unrealistic expectations of the study, unstable personality, or other significant psychiatric conditions.	ASR microchip. surgery with cataract removal in 3 patients to facilitate viewing of the implant during surgery. 1 patient underwent secondary anterior chamber intraocular lens implantation 1 month after the ASR implantation and 2 others were left aphakic	Study was scheduled to span postoperative days1 through month 24 but actual patient followup was between 6 and 18 months. Authors reported 10-year followup for 1 patient.

AMD=age-related macular degeneration; ASR=Artificial Silicon Retina; CGAT=Chow Grading Acuity Test; dB=decibel; ETDRS=Early Treatment Diabetic Retinopathy Study test; FDA=U.S. Food and Drug Administration; IDE=investigational device exemption; LP=light perception; NR=not reported; OCT=optical coherence tomography; OU=both eyes; RP=retinitis pigmentosa; RPS=retinal prosthesis system; STS=Suprachoroidal Transretinal Stimulation; VA=visual acuity