

Supplementary Table 1. Advancement in KPro designs and approaches.

Year	Materials used	Design/approach	Refs
1789	Silver-rimmed convex glass disk	During the French Revolution in 1789, a French surgeon Guillaume Pellier de Quengsy published the first monograph in Ophthalmology and narrated a prototype KPro made of silver rimmed watch glass, although he never implanted one.	9, 10
1853-1855	Glass device in collar-stud design	In the middle of 19 th century, Nussbaum discovered the bio-inertness of glass by experimenting on himself. He proposed a collar-stud device to sandwich the cornea between the two plates, which he implanted in animals and humans with retention for 3 years and 7 months, respectively.	11, 12
1860	Quartz	Heuser implanted a quartz system in a blind child, which was sustained for 6 months with a successful return of vision.	13
1862	Glass optic with skirt made of rubber and milk protein (casein)	Abbate recognised the need for soft and bio-integrable skirt materials and used milk protein and rubber skirt with a glass optic for his KPro, which was used in animals, however it was extruded in a short time. Though it failed, his experiments underscored the value of incorporating an anchoring skirt.	13
1900	Quartz disk with platinum ring and flanges	In a platinum ring with prongs, Salzer used a system made of quartz crystal, a popular early KPro model with retention in humans for up to 1 year. He found that the optic should be lighter than glass and prosthetic rim should be made of a bio-integrable material.	13
1950–1958	PMMA disk	During World War II, in the mid-20 th century, Stone and Herbert implanted perforated poly(methyl methacrylate) PMMA disks implanted into the corneal lamellae of rabbits with retention for more than 3 years.	17, 18
1969	PMMA (nut and bolt)	Cardona developed a two-piece nut and bolt KPro with a detachable optic made from PMMA. Cardona also developed the idea of extending the optical stem to project beyond the eyelids in cases with an extremely dry ocular surface.	19

1967– 1978	Perspex CQ – one-piece and two-piece designs	This device was implanted in intra-lamellar or penetrating fashion. With the initial KPro devices, skirt was implanted first followed by insertion of the threaded optic at a later stage. There was either a corneal or sclero-corneal graft protecting the implant. The subsequent models were manufactured in a single-piece configuration and implanted in two phases.	20
1974	PMMA collar button	Dohlman developed a two-piece KPro made of PMMA, which eventually was popularised as the present-day Boston KPro. It consists of one front and one back plate made of PMMA. The front plate contains the optical stem. The back plate was made of black PMMA in some devices.	23
1974	Silicone-satellite KPro	Ruedemann devised a satellite-shaped optical piece made of silicone attached to a Dacron skirt.	15
1983	Pigmented PMMA optics and Teflon skirt	A peripherally pigmented PMMA optical cylinder was inserted through the cornea, whereas the Teflon skirt was anchored to the sclera.	21
1983	Modified Cardona's nut and bolt with Dacron or Proplast skirt	The nut-and-bolt concept of Cardona was applied to this device, but the skirt material was taken from Dacron or Proplast. Prosthesis was covered with Tenon's capsule and conjunctiva. The optic was exposed by excision of the conjunctiva after 3 months.	24
1983	Aluminum oxide (Ceramic)	The skirt and optics were made from ceramic for this epicorneal device. The device's concept was to rest the skirt on the cornea and transfer the threaded optical cylinder through the skirt's central threaded hole and the cornea as well. The whole device was covered for 1 - 2 weeks with periosteum or Tenon's capsule and conjunctiva, during which the optic was exposed by excising the overlying tissue.	16
1997	Polyurethane elastomer optic and PTFE skirt	Caldwell developed a transparent polyurethane optic with a six-pronged porous PTFE polymer skirt, which was inserted into the intra-lamellar corneoscleral pocket.	14
1995	Champagne cork KPro (glass or	Worst and co-workers devised a rivet-shaped champagne cork style KPro and anchored it to the sclera by using steel wires. It is a collar-stud device consisting of an anterior plate connected	14, 22

	polycarbonate optic)	to a progressively enlarged cone-shaped optic. The polycarbonate optic is inserted through the central corneal aperture.	
1995	Elongated PMMA optic with Dacron skirt	<p>Pintucci used a Dacron skirt with PMMA optical cylinder and implanted the device as a two-stage.</p> <p>First Stage - The ocular surface of the diseased eye is prepared, keratinized tissue is removed, and a patch of the buccal mucosa is grafted, which forms the new ocular surface. At the same time, the device is implanted into the submuscular pouch of the contralateral lower lid for connective tissue ingrowth. Second Stage- The device is extracted from the submuscular pocket and implanted into the eye under the buccal mucosa.</p>	25, 26
1998-2003	Polymeric hydrogel	First hydrogel KPro from poly-hydroxyethyl methacrylate poly(HEMA) (AlphaCor) was prepared by Chirila as a core-skirt model, which was implanted in humans. It is a soft, flexible, one-piece system consisting of a transparent core (as a central optic) and an opaque porous tissue-integrable skirt allowing bio-integration with surrounding corneal tissue. Both components were made of poly(HEMA).	13, 27