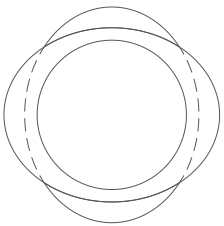
BAG-IN-THE-LENS
IOL AND TECHNIQUE



MADE IN GERMANY

THE BAG-IN-THE-LENS

Modern intraocular lens (IOL) implantation was pioneered by Sir Harold Ridley in 1949. From the very beginning, two major challenges were identified:

1. Lens decentration
2. Posterior capsule opacification (PCO).

The Bag-in-the-Lens (BIL) concept was specifically developed to address these limitations. It was patented as:

"Intraocular lens and method for preventing secondary opacification"
(US 6,027,531; EP 0916320A2).

The first clinical implantation of the BIL was performed in December 1999 [1]. Since then, long-term follow-up data of more than ten years have demonstrated excellent outcomes, including **low PCO rates** (≤10%) and **high centration stability** [1–11, 22].

DESIGN AND TECHNICAL PRINCIPLE

The Bag-In-the-Lens (BIL) technique is a specialized method for IOL implantation based on the specific lens design.

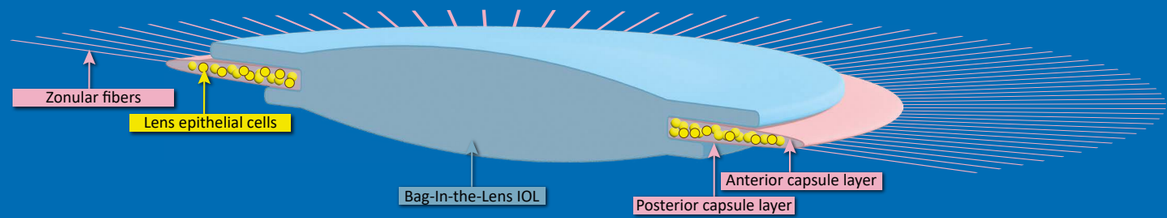
The Bag-In-the-Lens (BIL) IOL has two perpendicularly oriented elliptical haptics, which form a circumferential groove at the edge of the IOL optic.

During cataract surgery, an anterior continuous curvilinear capsulorhexis (ACCC) and a primary posterior continuous curvilinear capsulorhexis (PPCCC) of defined sizes are created to fit the IOL's groove.

Unlike conventional in-the-bag IOLs, which are located within the capsular bag ("lens-in-the-bag" approaches, LIB IOL), the BIL IOL captures the ACCC and PPCCC edges in its groove. Due to this principle of secure capture of the rhexes edges within the circumferential groove of the lens, the technique is called "Bag-In-the-Lens" (BIL).

This approach with a 360° fixation of the BIL IOL ensures:

- **precise, surgeon-guided IOL centration**
- **a mechanical barrier against lens epithelial cell migration** and thus, counteracting the formation of secondary opacification
- covering of the rhexis margins and thus, **counteracting negative dysphotopsia**



CLINICAL KEY BENEFITS

SURGEON-CONTROLLED IOL CENTRATION

The centration of conventional LIB IOLs is influenced by postoperative capsular bag behavior. In contrast, BIL centration is determined intraoperatively through precise alignment of the anterior and posterior capsulorhexis. This facilitates accurate positioning along the visual axis, guided by Purkinje reflexes.

ROTATIONAL STABILITY

Because the capsular edges are firmly secured in the peripheral groove of the lens, the BIL remains stable in its position over time [12–14].

REDUCTION OF SECONDARY OPACIFICATION

The BIL design encloses residual lens epithelial cells (LECs) within a secluded peripheral compartment. By mechanically preventing cell migration into the optical axis, the technique significantly reduces the incidence of posterior capsular opacification (PCO) / visual axis re-opacification (VAO).

Clinical studies have demonstrated low rates of secondary opacification, potentially reducing or eliminating the need for Nd:YAG capsulotomy in many cases [1,5,6,9,15,16].

PAEDIATRIC CATARACT SURGERY

The BIL technique is particularly advantageous in paediatric cataract surgery with VAO rates below 10 to 20 %, where secondary opacification is otherwise highly prevalent. In many cases, it allows prevention of anterior vitrectomy [5–9,17–20].

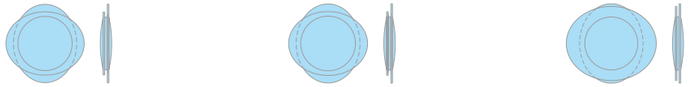
COMPARISON

Comparison of Bag-In-the-Lens vs. conventional IOL (“lens-in-the-bag”) implantation

FEATURES / ASPECTS	CLASSIC “LENS-IN-THE-BAG”	BAG-IN-THE-LENS
Fixation principle	Lens inside the capsular bag, held in place solely by the capsular bag	360° capsular fixation
IOL position	■ Risk of decentration, tilt, and rotation ■ Final lens position might be hard to predict	■ Highly stable due to limitation of all degrees of freedom ■ Final lens position is highly predictable
Posterior capsular opacification (PCO) / Visual axis re-opacification (VAO)	Common	Significantly reduced
Explantation / repositioning	Complex	Relatively straightforward [21]
Surgical learning curve	Standard	Requires specific training, but is reproducible among surgeons

TECHNICAL DATA

BAG-IN-THE-LENS SERIES



Model (REF)	89A	89D	89F
Indication	Adults Pediatrics	For short eyes (< 18.0 mm) and / or small white to white < 10.0 mm	Combined cataract and vitrectomy procedures or in eyes with large pupils
Total Major / Minor Axis Haptics	7.5 / 6.0 mm	6.5 / 5.25 mm	8.5 / 7.0 mm 7.5 / 6.0 mm
Effective Optical Diameter	5.0 mm	4.5 mm	5.0 mm
Standard Diopter Range	10.0 – 30.0 D (0.5 inc.)	-	10.0 – 30.0 D (0.5 inc.)
On Request Diopter Range	-13.0 – 9.5 D (0.5 inc.) 30.5 – 35.0 D (0.5 inc.)	8.5 – 35.0 D (0.5 inc.)	8.5 – 9.5 D (0.5 inc.)
Theoretical A-Con. (optical)	118.2	118.2	118.2
Theoretical ACD (optical)	5.08 mm	5.08 mm	5.08 mm
Material	Hydrophilic Acrylic	Hydrophilic Acrylic	Hydrophilic Acrylic
Water Content	28.0 %	28.0 %	28.0 %
Filter	UV-Filter	UV-Filter	UV-Filter
Refractive Index	1.46	1.46	1.46
Recommended Caliper Ring*[1] for ACCC*[2]	REF 5 REF 4L (PED)	REF 4L	REF 5
Note	Surgeons must partake in prerequisite course before implantation!		
Security Advice	Due to the possibility of iris capture it is recommended to keep the pupil in myosis in the early postoperative period.		

*[1] Gauge for Capsulorhexis | *[2] Anterior Continuous Curvilinear Capsulorhexis

CALIPER RINGS

Model (REF)	4L	5
Total Diameter	4.8 mm	5.3 mm
Capsulorhexis Ø (Inner Diameter)	4.5 mm	5.0 mm
Material	Black PEMA	Black PEMA
Bag-In-the-Lens Model	REF 89D	REF 89A / 89F

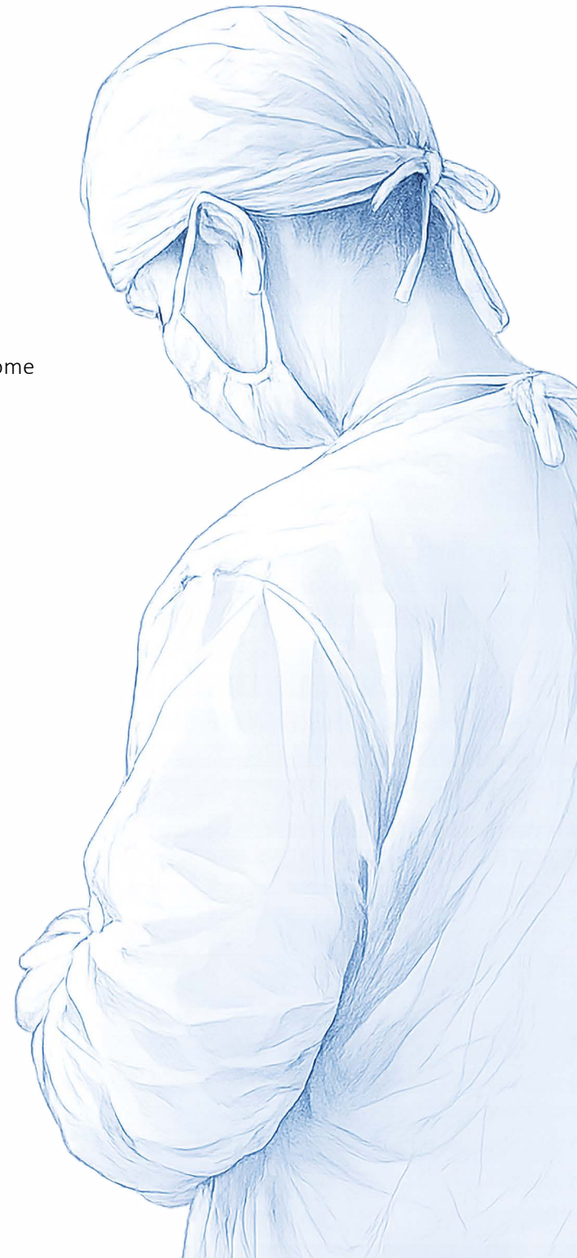
HOW TO BECOME A BIL USER

Requirements according to Professor Tassignon

Those surgeons, who are interested to implant the BIL, can become certified after having performed the following training:

- Wetlab and instructional course at the annual meeting of the European Society of Cataract and Refractive Surgeons (ESCRS)
- Observership at centers with senior BIL instructors
- Surgeons who invited one of the senior BIL instructors to coach them in their hospital and operating facilities

More information about senior BIL instructors at:
www.morcher.com/bil



VIDEO LIBRARY

provided by Professor Tassignon

SURGICAL TECHNIQUES

NO	INDICATION	PARTICULARITIES
0	**Bag-In-the-Lens Cataract Surgery**	
1	**High Myopia**	Capsular Tension Ring
2	**Uveitis Anterior**	
3	**Uveitis Anterior**	
4	**Uveitis Anterior**	Stick-Caliper
5	**BIL Implant Only**	Forceps Implantation
6	**Pigment Anterior Vitreum**	ACCC + BIL Insert
7	**BIL Implantation**	IOL rotation
8	**Metabolic Cataract**	Full procedure
9	**89F IOL**	Longer Anterior Haptic

SPECIAL CASES

NO	INDICATION	PARTICULARITIES
10	**Weak Zonular Fibers**	Prolene Lasso Scleral Fixation
11	**Traumatic Lens Luxation**	Prolene Lasso Scleral Fixation

COMBINED BIL SURGERY

NO	INDICATION	PARTICULARITIES
12	**BIL + PKP**	Open-Sky-BIL
13	**BIL + DSAEK**	Anterior Chamber
14	**Anterior Phakic IOL Exchange**	Capsular Tension Ring

BIL EXCHANGE

NO	INDICATION	PARTICULARITIES
15	**Refractive Error**	Post Penetrating Keratoplasty
16	**Refractive Error**	Post Radial Keratomy + Intacs

CONGENITAL CATARACT

NO	INDICATION	PARTICULARITIES
17	**Child Eye**	Posterior Capsule Plaque
18	**Child Eye**	Posterior Capsule Plaque
19	**Young Adult**	Anterior Capsule Plaque
20	**Child Eye**	Vitreous Interface/41G Needle
21	**Marfan**	Dislocated Lens
22	**Anterior PHPV**	Interface Dissection

IOL EXCHANGE

NO	INDICATION	PARTICULARITIES
23	**Multifocal IOL**	Capsular Peeling
24	**Acrysof**	Posterior Capsule
25	**Multifocal IOL**	Capsular Peeling
26	**Decentrated Silicone IOL**	Posterior Continuous Curvilinear Capsulorhexis Rupture
27	**Decentrated IOL**	Damaged IOL
28	**Opaque H 60 M**	Capsular Peeling
29	**Yellow IOL**	ACCC/PCCC
30	**Traumatic Cataract**	Capsular Tension Ring
31	**Capsular Contraction Syndrome**	Capsular Peeling

TORIC BIL

NO	INDICATION	PARTICULARITIES
32	**Second Implant**	Cleaning Interface
33	**Congential Astigmatism**	Pukinje Centration
34	**Congential Astigmatism**	Pukinje Centration
35	**Trilogy**	Pukinje Centration
36	**Adult Cataract**	Corneal Astigmatism

EDITED VIDEOS WITH SOUND

NO	INDICATION	PARTICULARITIES
37	**3 cases**	Implantation in child eye
38	**2 cases**	Mysteries of the Anterior Hyaloïd
39	**The Challenging Anterior Vitreolenticular Interface**	Congenital dysgenesis of the anterior vitreo-lenticular interface

BIBLIOGRAPHY

[1] Tassignon MJ, Gobin L, Mathysen D, Van Looveren J, De Groot V. Clinical outcomes of cataract surgery after bag-in-the-lens intraocular lens implantation following ISO standard 11979-7:2006.
J Cataract Refract Surg. 2011;37(12):2120-2129. doi:10.1016/j.jcrs.2011.06.025

[2] Tassignon MJ, Van den Heurck JJI, Boven KBM, et al. Incidence of rhegmatogenous retinal detachment after bag-in-the-lens intraocular lens implantation.
J Cataract Refract Surg. 2015;41(11):2430-2437. doi:10.1016/j.jcrs.2015.05.026

[3] Verbruggen KHM, Rozema JJ, Gobin L, Coeckelbergh T, De Groot V, Tassignon MJ. Intraocular lens centration and visual outcomes after bag-in-the-lens implantation.
J Cataract Refract Surg. 2007;33(7):1267-1272. doi:10.1016/j.jcrs.2007.03.022

[4] Scheers D, Rens J, Van Os L, et al. Safety of the bag-in-the-lens implantation regarding the development of clinically significant pseudophakic cystoid macular edema: A retrospective case series study.
Plos one. 2023;18(1):e0278861.

[5] Nyström A, Almarzouki N, Magnusson G, Zetterberg M. Phacoemulsification and primary implantation with bag-in-the-lens intraocular lens in children with unilateral and bilateral cataract.
Acta Ophthalmol. 2018;96(4):364-370. doi:10.1111/aos.13626

[6] Lytvynchuk LM, Thiele MV, Lorenz B. Analysis and management of intraoperative and early postoperative complications of bag-in-the-lens intraocular lens implantation in different age groups of paediatric cataract patients: report of the Giessen Paediatric Cataract Study Group.
Acta Ophthalmol. 2020;98(2):e144-e154. doi:10.1111/aos.14229

[7] Sand MK, Cholidis S, Kristianslund O, Drolsum L. Bag-in-the-lens intraocular lens implantation before 12 weeks of age in congenital cataract.
Acta Ophthalmologica. Published online 2023.

[8] Küchlin S, Hartmann ES, Reich M, et al. Pediatric cataract surgery: rate of secondary visual axis opacification depending on intraocular lens type.
Ophthalmology. 2022;129(9):997-1003.

[9] Boonstra NE, Haugen OH. Bag-in-the-lens intraocular lens in paediatric cataract surgery: intraoperative and postoperative outcomes.
Acta Ophthalmol. 2022;100(1):e135-e141. doi:10.1111/aos.14878

[10] Scheers D, Van Os L, Ní Dhubhghaill S, Wouters K, Tassignon MJ. Clinically significant pseudophakic cystoid macular edema after bag-in-the-lens implantation.
J Cataract Refract Surg. 2020;46(4):606-611. doi:10.1097/j.jcrs.0000000000000102

[11] Van den Heurck JJI, Boven KBM, Van Looveren J, Mathysen DGP, Chiairi I, Tassignon MJ. Incidence of rhegmatogenous retinal detachment after bag-in-the-lens IOL implantation: extended follow-up in a larger cohort of patients.
J Cataract Refract Surg. 2020;46(6):820-826. doi:10.1097/j.jcrs.0000000000000164

[12] Rozema JJ, Gobin L, Verbruggen K, Tassignon MJ. Changes in rotation after implantation of a bag-in-the-lens intraocular lens.
J Cataract Refract Surg. 2009;35(8):1385-1388. doi:10.1016/j.jcrs.2009.03.037

[13] Tassignon MJ, Gobin L, Mathysen D, Van Looveren J. Clinical results after spherotoric intraocular lens implantation using the bag-in-the-lens technique.
J Cataract Refract Surg. 2011;37(5):830-834. doi:10.1016/j.jcrs.2010.12.042

[14] Gobin L, Tassignon MJ, Wouters K, De Groot V. Surgically induced astigmatism after intraocular lens implantation using the bag-in-the-lens technique.
J Cataract Refract Surg. 2011;37(6):1015-1019. doi:10.1016/j.jcrs.2010.12.043

[15] Leysen I, Coeckelbergh T, Gobin L, et al. Cumulative neodymium: YAG laser rates after bag-in-the-lens and lens-in-the-bag intraocular lens implantation: comparative study.
J Cataract Refract Surg. 2006;32(12):2085-2090. doi:10.1016/j.jcrs.2006.07.025

[16] De Groot V, Leysen I, Neuhann T, Gobin L, Tassignon MJ. One-year follow-up of bag-in-the-lens intraocular lens implantation in 60 eyes.
J Cataract Refract Surg. 2006;32(10):1632-1637. doi:10.1016/j.jcrs.2006.05.007

[17] Magnusson G, Gyllén J, Haargaard B, et al. The prevalence of visual axis opacification in the Swedish Pediatric Cataract Register.
Acta Ophthalmol. 2024;102(6):e873-e882. doi:10.1111/aos.16630

[18] Tassignon MJ, De Veuster I, Godts D, Kosec D, Van den Dooren K, Gobin L. Bag-in-the-lens intraocular lens implantation in the pediatric eye.
J Cataract Refract Surg. 2007;33(4):611-617. doi:10.1016/j.jcrs.2006.12.016

[19] Nyström A, Magnusson G, Zetterberg M. Secondary glaucoma and visual outcome after paediatric cataract surgery with primary bag-in-the-lens intraocular lens.
Acta Ophthalmol. 2020;98(3):296-304. doi:10.1111/aos.14244

[20] Van Looveren J, Ní Dhubhghaill S, Godts D, et al. Pediatric bag-in-the-lens intraocular lens implantation: long-term follow-up.
J Cataract Refract Surg. 2015;41(8):1685-1692. doi:10.1016/j.jcrs.2014.12.057

[21] Ní Dhubhghaill S, Quigley C. The BIL Exchange Technique.
In: Innovative Implantation Technique: Bag-in-the-Lens Cataract Surgery. Springer; 2019:111-115.

[22] Tassignon MJ, Ní Dhubhghaill S, Van Os L (Editors). Innovative Implantation Technique: Bag-in-the-Lens Cataract Surgery.
Springer; 2019:111-115.

THE BIL IOL IN SPECIAL CASES

Van Os L, Hildebrand GD, Tassignon MJ. Adapted Bag-in-the-Lens Implantation Technique in Children with Congenital Ectopia Lentis.
Klin Monbl Augenheilkd. 2021;238(10):1058-1064. doi:10.1055/a-1633-4316

Lauwers N, Ní Dhubhghaill S, Mathysen DGP, Tassignon MJ. Assessment of the bag-in-the-lens implantation technique in diabetic patients.
Ophthalmologica. 2013;229(4):212-218. doi:10.1159/000350236

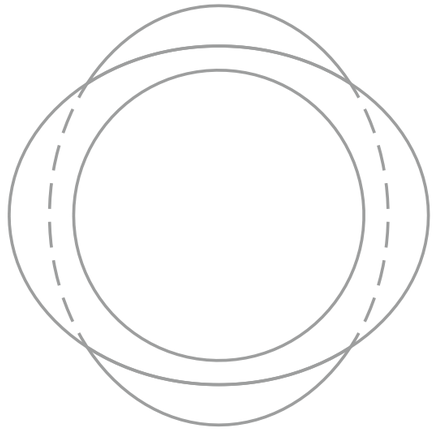
Dick HB, Canto AP, Culbertson WW, Schultz T. Femtosecond laser-assisted technique for performing bag-in-the-lens intraocular lens implantation.
J Cataract Refract Surg. 2013;39(9):1286-1290. doi:10.1016/j.jcrs.2013.07.014

Auchère Lavayssiere C, Lux AL, Beraud G, Degoumois A, Billotte C, Denion É. Bag-in-the-lens implantation helps avoid posterior synechiae of the iris after phacovitrectomy.
J Cataract Refract Surg. 2019;45(10):1386-1392. doi:10.1016/j.jcrs.2019.05.054

López-Sánchez E. Advantages of combined cataract and vitrectomy surgery with the «Bag-In-the-Lens».
Arch Soc Esp Oftalmol (Engl Ed). 2018;93(11):e82-e83. doi:10.1016/j.oftal.2018.07.001

In accordance with contemporary standards, the surgical intervention for cataract treatment yields optimal visual outcomes.

The Bag-in-the-Lens (BIL) technique, developed by Professor Marie-José Tassignon, represents an innovative approach, which **enhances intraocular lens stability while significantly reducing the risk of posterior capsule opacification (PCO).**



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