

A Century of Surgical Innovation in Glaucoma: From Fistula Tubes to Modern Implants					University of East Anglia
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Background		Method		Results	
Open-Angle Glaucoma (OAG) occurs when the trabecular meshwork of the eye is insufficient in drainage, raising intraocular pressure (IOP) and causing damage to the optic nerve. Glaucoma drainage devices (GDDs) have been used to help reduce IOP and they have evolved massively over the last century. While these individual drainage devices have been well documented, there are no recent reviews of their evolution within a historical context. This review aims to map the timeline of events leading to the current gold standard treatments for OAG.		A literature search was conducted via on PubMed, Ovid (Embase), and Cochrane using the keywords “glaucoma drainage device”, “glaucoma implant” and “open-angle glaucoma” from inception to 01/12/2025. The relevant articles were screened for inclusion and a narrative review was conducted on the the 1st of December 2025 to identify those relevant to the history and development of GDDs.		- Mr Arthur Zorab (1880-1934) was the very first to implant a GDD in 1912: the insertion of a silk thread through the limbus created a permanent pathway for drainage. - Lack of control over fluid drainage resulted in unsatisfactory results due to high incidences of hypotony and silk’s lack of biocompatibility. - Alternative materials such as gold and cotton were also trialled but showed similar rates of inflammation and dense scar tissue formation, leading to blockages. - In 1966, a breakthrough was made in the form of the Molteno implant, developed by Professor Anthony Molteno (1938-2023). - The Molteno implant is a non-valved plate placed under the conjunctiva and connected to a tube inserted into the eye’s anterior chamber, allowing aqueous fluid to slowly seep out. ¹ - Absence of a valve provided inferior control over drainage, increasing postoperative disposition to hypotony. - The Krupin Valve, developed in 1976 by Dr. Theodore Krupin (1942-2015), used a pressure sensitive valve that closes once IOP gets too low. - It was one of the earliest attempts to prevent early hypotony with valves and laid the groundwork for further innovation. - The Baerveldt shunt, created by Dr. George Baerveldt (1945 - 2021), was approved for use in 1990. - Its major advantage was a larger surface area for fluid drainage, providing a lower long-term IOP. ² - The Ahmed valve, developed by Dr. Abdul Mateen Ahmed in 1993, used a venturi-based valve and was more effective at reducing early hypotony. - The Ahmed valve has a lower incidence of early hypotony but complications like mid-term pressure rises. - The Baerveldt shunt achieves a lower mean IOP over time but has a higher risk of early hypotony. ³ - Micro-stents such as the ‘iStent’ were first developed in 1999 and first implanted into a human eye in 2001, leading to the term minimally invasive glaucoma surgery (MIGS). - The iStent was FDA approved in 2012 and developed and marketed by Glaukos Corporation.	
Conclusions					
When evaluating the various iterations of GDDS through time, their clinical success seems to be defined by whether the associated complications are offset by their efficacy in IOP reduction. This review chronologically organises and critically compares GDD innovation and use in clinical practice. Future research should aim to standardise outcome measures and long-term comparative data should be acquired to improve safety and personalised device selection.					
References					
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