

HISTORY OF IRIDECTOMY IN PRE-GONIOSCOPIC ERA

George Gorin
New York

The evolution of ideas about iridectomy as a surgical cure for glaucoma is a classical example of a useful operation in its struggle for acceptance over a period of 200 years.

The first one to introduce iridectomy for reconstruction of the pupil was WILLIAM CHESELDEN (1688–1752) in 1728. He was the best known general surgeon of his days in London. His book "*Anatomy of the Human Body*" published in 1713 came out in 12 editions till 1790. CHESELDEN devised a needle in 1728 with a cutting edge on one side. He entered the eye at 3 mm from the limbus into the anterior chamber, cut through the iris and turned the needle forward, thus forming a new pupil. Some think that WOOLHOUSE, an Englishman who practiced in Paris, had first the idea in 1717 of cutting the pupil open, but he is not known of having done the operation.¹ CHESELDEN's operation has undergone many modifications. The first one was by CHESELDEN himself, then by his disciple SHARP in 1740 and PELLIER DE QUENGSY in 1783 who did a simple iridectomy in central leucoma of the cornea for optical reasons. This was 100 years before DE WECKER did iridectomy with his special scissors. A similar operation was done by SCARPA in 1817 and by the Barons WENZEL, father and son, in

1786. They excised the iris and also did a cataract extraction when necessary. Formation of a new pupil was also done by FORLENZA (1769–1833) in Naples. He made a corneal incision like for a cataract extraction and excised the iris. His operation was abandoned because of complications, but was resumed with a narrow knife, which gave better results. DE WECKER modified this operation to make it safer by pulling out the iris and cutting it with his special scissors. He did not enter the anterior chamber and thus avoided injury to the lens.¹

In 1798 JOSEF BEER of Vienna described a procedure for restructuring of the pupil by doing an iridectomy through a limbal section of the cornea, pulling out the iris and cutting it with scissors. The operation of BEER was accepted and popularized by DESMARRES and it was still used in the middle of the 19th century. SHASTID (1915)² gives BEER priority for introduction of iridectomy before ALBRECHT VON GRAEFE. However, in the decision on priority, one should consider the whole matter in context with a better insight into glaucoma (although still incomplete) and v. GRAEFE's understanding of cupping as seen with the newly invented ophthalmoscope. v. GRAEFE gave us a surgical cure for glaucoma, while BEER did iridectomy for the same reason as CHESELDEN had done in 1728, i.e. for reconstruction of the pupil.

Incarceration of the iris in reconstruction of the pupil was practiced by LANGENBECK and PAGENSTECHEER but was given up because of the development of sympathetic ophthalmia. JACQUES DAVIEL (1696–1762) incised or excised the iris before cataract extraction, whenever the pupil did not dilate or when the cataractous lens was very large. Once he removed the whole lower half of the iris, thus practicing iridectomy in cataract extraction before A. v. GRAEFE.³ In 1864, GRAEFE and his pupil MOOREN introduced iridectomy as a preliminary operation before cataract extraction. Thus, they cut their operative losses from 11% to 3.5%.

The invention of iridectomy against glaucoma by A. v. GRAEFE can be traced back to the period (1849) when he worked in Paris with DESMARRES, who did about a dozen iridectomies every week in cases of staphyloma and occluded pupils resulting from chronic iridocyclitis or hypermature cataract. Together they analyzed every case and observed that after iridectomy many eyes became softer, the anterior chambers deepened, the corneas cleared, pain subsided and vision improved.⁴ In cases of adherent leucoma DESMARRES (1850) tore the adherent iris from the cornea together with the anterior capsule.

A. v. GRAEFE first considered iridectomy for treatment of secondary glaucoma in severe choroiditis and chronic iridocyclitis with occlusion of the pupil. The idea of doing iridectomy in treatment of iridocyclitis was further popularized by E. FUCHS and was still quoted in the 7th edition of his textbook. As late as in 1966 DUKE-ELDER stated that iridectomy as a treatment of iridocyclitis is

helpful in certain cases. GRAEFE believed that the presence of broad posterior synechiae predisposed the eye to recurrent acute attacks of iridocyclitis. For this reason he advocated broad excision of the iris including the sphincter. In cases where there was total adhesion between the iris and the lens GRAEFE advocated lens extraction besides iridectomy.

v. GRAEFE then broadened his indications for iridectomy from adherent leucoma, anterior staphyloma and occlusion of the pupil to acute attacks of glaucoma for which there was no effective treatment. Such eyes were considered intractable and usually were lost. Iridectomy as a surgical cure for acute glaucoma brought A. v. GRAEFE international fame. When he reported it at the first International Congress of Ophthalmology in Brussels in 1857 he received a long ovation. Acute glaucoma had finally become a curable disease. GRAEFE performed the first iridectomy for acute glaucoma in June 1856. The story is told that his former teacher ARLT of Vienna came to Berlin to convince himself about the effect to the operation. It saved the eye of his wife who had an acute attack of glaucoma.

It was soon recognized that iridectomy worked only in certain cases, especially acute ones, and not in all forms of glaucoma. BOWMAN, who introduced iridectomy in England, was unsuccessful in the treatment of his first 2 cases. He persisted in the use of iridectomy and was successful in many cases thereafter. The reason for this eluded A. v. GRAEFE, who noted also that iridectomy on one eye sometimes precipitated an acute attack in the other eye. He also discovered that in some cases treatment with Belladonna caused an acute attack of glaucoma.

Opposition to iridectomy stemmed from the fact that the rationale of the operation eluded A. v. GRAEFE and his contemporaries. Originally, GRAEFE thought that the increased water content in the eye during an acute attack of glaucoma was due to an exudative choroiditis, a belief he inherited from his teacher ARLT. Later, GRAEFE gave up that notion. Subsequently, he thought that after iridectomy there was a decrease of aqueous which did not reform to the original level following its loss during surgery. This was in line with the notion held at the time that an individual is born with a certain amount of aqueous which is stagnating and cannot be replaced after it is lost. This concept was demolished by the experimental work of LEBER, who in 1876 verified the idea of PORTER-FIELD of 100 years ago that there is a steady directional flow of aqueous in the eye.⁵

LEBER showed in his experiments that aqueous is formed constantly, circulates within the eye and is eliminated through the canal of Schlemm into the systemic circulation. Unfortunately, the ideas of LEBER of 1876 were not accepted by some even as late as 1946 when DUKE-ELDER stated: "*Experimental evidence demonstrates beyond doubt that the circulation of the intraocular fluid is very minute, much less than was realized by earlier investigators, but a circula-*

tion does exist." Other mechanisms by which iridectomy lowered intraocular pressure were advanced by A. v. GRAEFE, such as decrease in the formation of aqueous by the iris. A similar view was expressed by NUEL who believed that iridectomy simply decreased the aqueous-secreting surface of the iris. HENDERSON observed that the cut edges of the coloboma do not scar up and possibly serve as draining surfaces.

LEBER and COCCIUS (1859) explained the effect of iridectomy as due to establishment of communication between the anterior and posterior chambers. BOWMAN in 1872 theorized that iridectomy facilitated passage of fluid from the vitreous to the cornea which, he believed, eliminated it by a process of osmosis. Removal of the barrier between the chambers was considered by ULRICH in 1884 but there was no mention of pupillary block.

In search of an explanation for the effect of iridectomy GRAEFE turned to pathologic specimens of eyes lost from glaucoma. He found total peripheral anterior synechiae but understanding of glaucoma was not advanced enough to interpret these adhesions as an obstruction to outflow. These synechiae were studied in greater detail independently and almost simultaneously by MAX KNIES in 1876 and by ADOLF WEBER (1829–1915), a close friend and disciple of GRAEFE. KNIES published his studies on 14 eyes enucleated by OTTO BECKER following acute glaucoma. KNIES believed that the anterior peripheral adhesions were due to an inflammation in the area of the canal of Schlemm. He did not believe that closure of the angle was the cause of elevated IOP, although he knew of the value of eserine in opening the angle in such cases. WEBER also noted the adhesions and believed that they were torn loose during iridectomy thus reopening the access to the normal exit channels for aqueous. KNIES published his findings quickly in May 1876. WEBER kept his manuscript in a drawer for some time and did not get to publish it till September 1876.⁶ There is no question that the interpretation of WEBER was more correct than that of KNIES and brought ideas about the effect of iridectomy closer to the truth by emphasizing the events in the angle of the anterior chamber. This was followed by the ideas of PRIESTLEY SMITH⁷ in 1891 who was the first to put stress on the narrowness of the circumferential space and attributed acute glaucoma to an abnormality of the angle. CZERMAK (1898) believed that during iridectomy cutting of the pectinate ligament opened the communication between the anterior and posterior chambers.

The initial enthusiasm and acclaim of A. v. GRAEFE's iridectomy against glaucoma soon turned into a hostile antagonism toward GRAEFE, especially after his untimely death in 1870 at the age of 42 years. LOUIS DE WECKER in Paris in 1867 questioned the merits of v. GRAEFE in treatment of glaucoma by pointing out that elevated IOP was already noted by DEMOURS, WELLER, MACKENZIE and DESMARRES. But these authors, including MACKENZIE, recommended

repeated paracenteses and scleral punctures in acute attacks of glaucoma letting out some aqueous or vitreous but could not usually break the attack permanently as did iridectomy of GRAEFE. The controversy about iridectomy evoked frequent abuse of GRAEFE. Originally, SNELLEN supported GRAEFE but later at the meeting of the Heidelberg Ophthalmological Society in 1888 during the great debate on glaucoma SNELLEN rejected iridectomy as an adequate treatment of glaucoma. MACKENZIE objected to iridectomy as being too traumatic for the eye and advised posterior sclerotomy instead. This made GRAEFE angry and he replied: *"I should indeed have expected more moderation from the Nestor of English Ophthalmology; that he should not be hasty in judgement before getting some experience of his own with the procedure."* While rejecting iridectomy, MACKENZIE was still recommending in his book FLEMMING's tincture of Aconite and posterior sclerotomy for acute glaucoma.

DE WECKER after opposing GRAEFE later reversed himself and in 1879 played an important role in silencing opposition against GRAEFE's iridectomy. But even he felt that more than an iridectomy was necessary to cure glaucoma. For this reason he began doing sclerotomies in addition to iridectomy in the hope of establishing permanent external filtration. He did not succeed but his idea was realized later by several types of external filtering operations. DE WECKER sent out an inquiry in 1901 to 112 ophthalmologists¹ about their opinion of iridectomy. The replies contained 66 % who were opposed to iridectomy and only 16 % in favour. Against iridectomy were such ophthalmologists of repute as AXENFELD, BARRAQUER, DUJARDIN, CHEVELLEREAU, GALEZOWSKI, DE LAPERSONNE, SCHMIDT-RIMPLER, DEUTSCHMAN, PANAS, SNELLEN and VOELKERS. The operation was championed by DERBY, HIRSCHBERG, KUHN and UHTHOFF. Hearing about it, GRUT, one of the greatest of the old guard among ophthalmologists, threw up his hands in despair about the troublesomeness of the glaucoma problem.

The ideas of ADOLF WEBER of 1876 were the closest to our modern concepts of the effect of iridectomy in the light of our knowledge of gonioscopy. Yet, TRONCOSO argued in 1934 against WEBER that reopening of the angle was not a prerequisite for the success of iridectomy. TRONCOSO advanced the theory that iridectomy only reestablished communication between the anterior and posterior chambers. In this he was supported by such experienced gonioscopists as WERNER (1932), SOLANES (1937), MORATA (1943) and BUSACCA (1945). However, the studies of SUGAR (1939) confirmed WEBER's views of 1876 that iridectomy reopened the normal channels of outflow. Similar views were expressed by E. FUCHS already in 1923. SUGAR found that reopening of 45 to 60 degrees of circumference can provide normal outflow. KRONFELD (1944) estimated that 70 to 90 degrees are necessary.

The full explanation of the effect of iridectomy in glaucoma had to wait till the work of CURRAN in 1920, who noticed the shallow chamber of glaucomatous eyes. This suggested the idea of doing an iridotomy in the periphery of the iris. This resulted in deepening of the anterior chamber, an observation already made by A. v. GRAEFE. The work of BANZIGER (1932) popularized peripheral iridectomy. BARKAN's work in the middle of the 1930's finally provided a rational explanation for the effect of iridectomy and became the basis of the modern concept in the writings of HAAS, SCHEIE, SUGAR, SHAFFER, CHANDELER and others.

Summary

The first iridectomy was performed in 1728 by William Cheselden of London. This was 100 years before de Wecker did an iridectomy with his special scissors. In 1798, Josef Beer from Vienna described a procedure which became popular. But it was only in 1856 that von Graefe performed an iridectomy for acute glaucoma. This is a classical example of the resistance of ophthalmologists to new ideas. It took 200 years for the intuitive flash of genius, which inspired Albrecht von Graefe, to declare iridectomy as the answer to the hopeless problem of acute glaucoma and to accept it universally as an effective cure.

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**GORIN, G. – Histoire de l'iridectomie
avant l'invention de la gonioscopie**

Resumé

La première iridectomie a été faite en 1728 par William Cheselden de Londres. C'était 100 ans avant que de Wecker ne fit une iridectomie avec ses ciseaux spéciaux. En 1798, Joseph Beer de Vienne a décrit un procédé qui devint populaire. Ce n'est cependant qu'en 1856 que von Graefe fit une iridectomie pour un glaucome aigu. Ceci est un exemple classique de la résistance des ophtalmologistes à de nouvelles idées. Il fallut 100 ans avant que l'intuition générale, qui inspira Albrecht von Graefe, permit d'affirmer que l'iridectomie était la réponse au problème jusque là insoluble du glaucome aigu et de la faire accepter universellement comme un traitement efficace.

**GORIN, G. – Historia de la iridectomía
antes de la invención de la goniomotomía**

Resumen

La primera iridectomía fue hecha en 1728 por William Cheselden de Londres. Ocurrió 100 años antes de que de Wecker hiciera una iridectomía con sus tijeras especiales. En 1798, Joseph Beer de Viena describió un procedimiento que se popularizó. A pesar de esto solo es en 1856 que von Graefe hizo una iridectomía en un glaucoma agudo. Este es un ejemplo clásico de la resistencia de los oftalmólogos a las ideas nuevas. Se necesitó 100 años, antes de que la intuición general, que inspiró Albrecht von Graefe, permitiera afirmar de que la iridectomía era la respuesta al problema del glaucoma agudo hasta ese momento insoluble y de hacerla aceptar universalmente como un tratamiento eficaz.

**GORIN, G. – Geschichte der Iridektomie
in der vorgonioskopischen Zeit**

Zusammenfassung

Die erste Iridektomie hat im Jahre 1728 William Cheselden in London vorgenommen. Das war einhundert Jahre bevor de Wecker in Paris seine spezielle Iridektomieschere entwickelte. Eine Methode, die weite Verbreitung fand, hat dann 1798 Joseph Beer in Wien angegeben. Erst 1856 hat Albrecht von Graefe die Iridektomie bei akutem Glaukom eingesetzt. Das ist ein klassisches Beispiel für den

Widerstand vieler Ophthalmologen gegenüber neuen Entwicklungen. Es sollten immerhin 100 Jahre vergehen, bis sich aus der ursprünglichen genialen Idee, die Albrecht von Graefe inspiriert hatte, eine Behandlungsmethode für das bis dahin nicht therapierbare akute Glaukom entwickelte, die allgemein von der Fachwelt akzeptiert wurde.

Dr. George Gorin
585 West End Avenue
New York, N.Y. 10024
U.S.A.