Herbert Herbert: His corneal pits and scleral slits

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Herbert Herbert (Fig. 1) was born in the English county of Cheshire on February 25, 1865. (1,2,3) Obviously, when I began to study his life, the first question which arose was his unusual name. Herbert Herbert’s birth certificate documents that he was originally named Herbert Sherwood, and his mother was recorded as Alice Sherwood. His father was identified as Richard Sherwood. Sherwood was native of the Isle of Man, the large island in the Irish Channel between England and Ireland. Sherwood was a lawyer and a judge in the Island.

However, genealogic records from the Isle of Man show that Richard Sherwood had previously married another woman in 1851. They had three children, were never legally divorced, and when Richard Sherwood died, his obituary did not mention either his legal wife or his three known legitimate children.(4) In fact, Herbert’s mother was probably named Alice Herbert (not Sherwood), was not married to Richard Sherwood, and thus Herbert was illegitimate. (5) In
1876, Herbert Sherwood’s surname was changed from Sherwood to Herbert. Since he was only 12 years old at that time, I presume he could not do that himself. It is likely when his mother Alice had a falling out with Richard Sherwood, probably because he refused to marry her, she changed her son’s surname, but was not allowed to change his Christian name, thus accounting for the name of Herbert Herbert. There are other mysteries surrounding the life of Richard Sherwood. He sent his legitimate son to Australia, presumably to shield him from a family scandal. It is possible that Sherwood had not one but two illegitimate families, and Sherwood died under mysterious circumstances, either a suicide or possibly a murder victim. (6) Herbert Herbert was not born on the Isle of Man where his Father lived, but in a small village on the coast of the county of Cheshire, presumably where his Mother lived, which is across the Irish Channel from the Isle of Man.

In spite of this somewhat inauspicious start to his life in strict Victorian England, Herbert was educated at Leeds Medical School and graduated with his medical degree in 1886. He was awarded the membership of the Royal College of Surgeons and the licentiate of the Royal College of Physicians in the same year. In 1887, he entered the Indian Medical Service as a surgeon, and was originally posted to the Middle East where he served and saw active military service in Aden and East Africa. He 1891, he obtained the advanced qualification of Fellow of the Royal College of Surgeons.

At that time, Herbert decided to specialize in ophthalmology, although I could find no information on where he obtained his postgraduate training in ophthalmology. He then moved to Bombay (now Mumbai) India where he became professor of ophthalmic surgery at Grant Medical College, one of the premier medical institutions in India and one of the oldest schools for the teaching of Western medicine in Asia. He also became ophthalmologist at the Sir Jamshedjee Jeejeebhoy Group of Hospitals. He made good use of the large amount of clinical material at those institutions. While in India he described his findings in trachoma, studied
superficial keratitis, and began his studies on glaucoma surgery. He was very interested in histology and did all the pathological work on his patients in his spare time. He worked in Mumbai from 1895 to 1907.

As was customary for officers of the Indian Medical Service, after twenty years of service in India, he retired at age 42 with the rank of lieutenant-colonel and returned to England where he was appointed surgeon to the Midland Eye Infirmary at Nottingham in 1907. At this time, his work concentrated on developing newer techniques in glaucoma surgery and he published extensively in this field. At the outbreak of World War I in 1914, he rejoined the Indian Medical Service, serving on hospital ships, and ashore in both India and England. While in India, he had the opportunity to perform many more glaucoma operations. After the war, he settled in Sussex, England where he served as both a consulting ophthalmic surgeon and a pathologist. He was active in the Ophthalmological Society of the United Kingdom (now the Royal College of Ophthalmology) and served a term as a vice-president (Fig 2). He served on the editorial board of the journal *The Ophthalmoscope* for 14 years. He died on March 19, 1942, age 77.

Herbert was one of the four famous British ophthalmologists who served with great distinction in India at the end of the 19th century and beginning of the 20th century, during the years of British control. The other three were Henry “Jullundur” Smith (1859-1948) who championed the intracapsular extraction of cataracts rather than the more common extracapsular method, Robert Henry Elliot (1864-1936) who developed the trephination procedure for glaucoma filtering surgery and was a strong opponent of Herbert’s proposal of iris inclusion for glaucoma surgery, and Robert E. Wright (1884-1977) who developed a new technique in local anesthesia for ocular surgery and did extensive bacteriological research.
On a personal note, he was married and had four children. One of his sons became a general surgeon in England, one of his daughters became a doctor who worked, like her Father, in India, and a grandson was a general physician in England.

External disease

Some of Herbert’s earliest ophthalmologic publications were on cases of epidemic superficial punctate keratitis. (10) In retrospect, many of these cases were probably adenoviral in origin. He wrote two brief reports in which he reported the microscopic appearance of encapsulated bacilli in corneal epithelial scrapings. Discussion of these cases by other ophthalmologists tended to raise doubt as to whether these bacilli were the cause of this condition. In total he wrote four brief reports on this subject. Here I note early in his career a characteristic of his medical papers in that he would write a short paper and then invariably follow it with a “further note” which unfortunately offered little more than in the original report.

Thirty years after his initial reports in 1901, a much more complete analysis of this condition was reported from India in which careful bacterial studies failed to confirm the presence of the bacilli as noted by Herbert, and that filtration transmission studies indicated that the cause was probably viral. Herbert responded immediately with a rather petulant article decrying the fact that no other investigator had looked for or confirmed the presence of the bacilli which he had previously noted. He concluded that he “personally had no doubt whatever that the bacillus is the living infective agent of this disease.” He appealed for further investigation when the most recent report had clearly excluded any bacterial cause. As was his habit, Herbert often seemed unable to let any discussion conclude, but wanted to have the last word in the literature. (11)

Herbert was on much firmer ground when he became the first, or one of the first, investigators to identify the presence of eosinophils in the conjunctival discharge of eyes with
spring or vernal catarrh. His second report on this subject was an analysis of 39 cases seen in Bombay over a period of two years. He properly concluded that the presence of many eosinophils was very helpful in confirming the diagnosis of this condition, thus excluding other types of chronic keratoconjunctivitis, especially trachoma. He also noted the presence of tiny, white points on the limbal nodules of vernal catarrh; these are now referred to as Horner-Trantas’s spots. (12)

These studies confirm that Herbert was indefatigable in doing his own cytology and histology on his clinical material, and when he later returned to England, he worked as a pathologist as well as an ophthalmic surgeon. He published several papers on the pathology of chronic inflammation of the eyelids and conjunctiva.

Trachoma

Herbert’s name is now mainly remembered for his description of the limbal corneal pits found in trachoma. He described this in 1903. (13) At that time the slit lamp had not been invented; Alvar Gullstrand (1862-1930) invented the slit lamp in 1911 and it entered general use in the 1920s. Anterior segment examinations were conducted with hand-held loupes of up to 10 times magnification and focal illumination. Herbert clearly described the pannus of trachoma and the associated lymphoid follicles of the limbus. The presence of limbal follicles surrounded by a fine capillary network is sometimes referred to as Herbert’s rosettes. When the follicles resolve, he documented focal opacities which were depressed below the corneal surface and appeared as pits. (Fig. 3) He noted that in the dark-skinned natives of India, there was often a marked degree of pigmentation in the pits, while in white-skinned patients the pigmentation was not found. He observed that the pits corresponded to the sites where the follicles occurred. When less well developed, the pits produced a scalloped or festooned limbal border.
This original observation was soon confirmed by many other experts in this field, and welcomed as a sign that could reliably diagnose trachoma from other conjunctival and corneal diseases. (Figs. 4 and 5) The name of Herbert's pits was bestowed by the famous trachomatologist Arthur F. MacCallan (1873-1955) who extensively studied this disease in Egypt. (14) The pathology of these pits was described in 1935 by Archimede Busacca (1893-1971), a pioneer in the field of slit lamp biomicroscopy. He demonstrated that when the limbal follicles and corneal pannus start to heal, the fibrosis and scarring of the follicles leave a space where the resolved follicle formerly existed; this pit is then filled with corneal epithelium and appears optically clear, so that the stroma appears focally depressed. (15)

Herbert's pits or the scalloped limbal border are pathognomonic of trachoma and such a finding has never been noted in any other ocular disease. Once developed, they persist throughout life. The diagnostic importance of this finding cannot be overemphasized.

Herbert, in a clear and concise one page report, described the “sinuous lid border, a sign of trachoma.” His observation was that the nasal portion of the upper lid arched upward normally but that the temporal half of the lid presented a curve with the convexity downward. He pointed out that this was, in his experience, only seen in rather severe cases of trachoma. He observed that it was not due to cicatricial scarring, as it was noted before any lid scarring occurred. He hypothesized that the deformation was due to stretching and molding of the diseased and infiltrated tarsus from the blinking action of the lid. Unfortunately, he had no drawing or illustration of this finding in his report. This is now called Herbert's sign. Herbert did not comment on the presence of a concomitant ptosis, but other observers noted a ptosis as well, due to both the infiltration of Muller’s muscle and the levator aponeurosis with inflammatory cells, and the weight of the swollen tissues. (16) (Fig 6).
Herbert was clearly a careful observer of the clinical pathology in his practice, and able to make several useful observations which have stood the test of time.

Cataract Surgery

Herbert wrote two books about cataract surgery, based on his personal experience of about 5,000 extractions performed in India. He commented that “this is comparatively small experience for an ophthalmic surgeon of standing in India.” His first book was published in 1903 and was a brief exposition of only 105 pages. (17) It was favorably reviewed, sold out in 6 months, and a second edition was printed. Encouraged by this reception, he expanded this material into a second book, published in 1908. (18) This text was similar in organization to the first, but much more thorough and the material expanded to 385 pages. He stated that all his conclusions are formed by his experience in India and noted the differences between surgical practice in India and in the Western countries: for example, most of his Indian patients had chronic conjunctivitis, mainly trachoma, and thus extra attention in preparing the eye for surgery was required for Indian patients.

This major text is remarkable for its precise and careful organization and attention to all the details of the procedure. The writing is not as prolix or repetitive as in his later glaucoma text. Every step of his procedure is related in careful detail: he devotes 14 pages to the performance of the anterior capsulotomy and 29 pages to the cleansing and sterilization of the conjunctiva. The latter subject was of great interest to him: he stated that “the problem of the exclusion of exogenous infection still constitutes one of the most vital questions in cataract work” and that postoperative “infective processes constitute by far the most important departure from the normal course of events after operation”. He performed bacteriologic studies of the conjunctiva before and after his preferred method of cleansing of the field by irrigation with 1:3000 sublimate perchloride solution to demonstrate its effectiveness.
This text has much better drawings and photographs of his surgical technique than found in his later volume on glaucoma surgery. In contrast to his glaucoma writings where references to other surgeons is rare, this text contains over 200 references to the English, French, German, and American literature. This allowed him to not only describe his preferred surgical technique but also to present in great detail other techniques championed by his contemporaries, devoting 100 pages of his book to techniques recommended by other surgeons. For example, on the subject of suturing of the wound, he acknowledged the experience of other surgeons, but his opinion is that it is “altogether too difficult and complicated a measure, placing too great a strain upon the patient for general use.” This was the general standard of care at that time. No detail of the operation is too minor for him to consider: for example, he recommended that the beginning surgeon perform finger exercises with forceps having a strong spring to improve his manual dexterity, or that the handle of a Graefe knife “should be of ivory or aluminum, as steel is too heavy and too slippery when wet.”

He discussed at length the history and development of removal of the lens in the capsule and acknowledged the success achieved by his Indian colleague Henry Smith from the city of Jullundur in the Punjab, India. However, Herbert felt that the incidence of vitreous loss during intracapsular surgery, over 30% by other surgeons imitating Smith’s procedure, was unacceptable, compared to the usual rate of about 5% or less by surgeons performing the usual extracapsular procedure. He acknowledged the obvious advantage that intracapsular surgery avoided the vast majority of development of after-cataract and the subsequent necessity of a second procedure to clear the visual axis. Nevertheless, he stated that the simple needling of secondary cataract is so safe that performing extraction of the lens in the capsule, with the attendant high risk of vitreous loss was unacceptable. He admitted that he has very little experience in the intracapsular technique under discussion. Another example is his discussion of various types of capsulotomy. Herbert strongly favored a simple incision of the
anterior capsule with a toothed cystitome, as opposed to the removal of a flap of the central
anterior capsule with forceps. He acknowledged that the formation of secondary cataract is
much greater with his technique, but based on a few cases of his own in which his use of
capsule forceps caused vitreous loss or lens dislocation, he condemned the advantage of
removal of the anterior capsular flaps, and accepted as safer the problem of dealing with the
secondary procedures for after cataract. In these examples, as in others, he often formed
conclusions based on a very few results in his own experience without allowing for the
successful results of other surgeons

Much of his technique appears to the modern surgeon as rather rough and hurried. The
major cause for this is the absence of any oculomotor akinesia during surgery. Although
retrobulbar injection of cocaine had been introduced by Hermann Knapp (1832-1911) in 1884,
very soon after the discovery of cocaine for topical anesthesia by Carl Koller (1857-1944) in the
same year, it clearly was not used for ocular akinesia during surgery at this time. Herbert, in
common with his contemporaries, also avoided general anesthesia with either chloroform or
ether, due to postoperative vomiting and the consequent expulsion of intraocular tissues
through the unsutured wound. He thus depended on the patient’s self control of fixation: this
was tested preoperatively and if the patient showed lack of control, the surgical assistant spent
time teaching the patient how to hold his eye steady during surgery and led the patient through
exercises to increase the time the patient could accomplish this. At all stages of surgery,
Herbert gives advice on what to do to avoid complications if the globe moves during the
procedure. The use of a lid speculum to control the orbicularis was fraught with problems of
excessive squeezing causing vitreous loss, and often the speculum was removed or released
after making the incision, exposure being maintained by the assistant’s fingers on the lid. Since
the time that most patients could control their ocular fixation was limited, Herbert practiced
speedy surgery; this was also necessary because of the large volume of patients requiring surgery in India.

This text was also carefully and thoroughly reviewed in the major journals of the time, including both British and American journals. The *British Medical Journal* described it as “a standard work on cataract for many years to come, and we heartily congratulate Colonel Herbert on having produced such an extremely interesting and useful book.” (19) The review in the journal *The Ophthalmoscope* ran for 4 pages and concluded that his book was of “great importance” to ophthalmologists and emphasized the huge amount of practical details offered. (20) As was his habit, Herbert was unable to completely accept this favorable review, and immediately sent a letter to the editor decrying some minor points which he disagreed with in the review.

This author's impression Herbert's two texts on cataract extraction is mixed: the most positive points are his very careful and thorough presentation of all details in the operative and perioperative period, certainly useful for the beginning surgeon. However, he offers no new concepts and narrowly seems to press him own preferences in surgical techniques. Only in his interest and insistence on careful preoperative conjunctival preparation to avoid infection does he appear to present a new idea.

Glaucoma

Herbert's main professional interest and importance were in the field of glaucoma, especially in the development of glaucoma filtering surgery. He published over 25 papers in this area as well as a small text on this subject (out of the approximately 65 papers I could identify in his bibliography). His interest in the development of glaucoma surgery spanned 30 years from his first publication in 1903 till his last in 1934. In order to understand the importance of his
contributions, a brief review of the history of the development of early glaucoma surgery is needed.

The first surgery for glaucoma, indeed the first successful therapy at all for glaucoma, was the operation of a large, basal iridectomy introduced by Albrecht von Graefe (1828-1870) in 1857. This operation held the field practically undisputed for the next 50 years, but while it was acknowledged to be very useful in acute and subacute forms of glaucoma, most surgeons noted disappointing results in chronic glaucoma. It was Louis de Wecker (1832-1906) in 1867 who first suggested that the value of the operation was not in the excision of the iris, but in the incision of the sclera and the formation of a filtering scar or cystoid cicatrix. De Wecker’s hypothesis was partially accepted but his operation of sclerotomy in the region of the angle was disappointing due to its failure to produce a permanent result. There was some delay in progress in this area, but with the introduction of topical anesthesia in 1884, Maklakoff tonometry in 1885, and Schiotz tonometry in 1905, the stage was set for the development of various filtering procedures.

The basic principles of modern filtering surgery were introduced in the period from 1900 to 1920, and fell into three types. The first, introduced in 1905 by the Frenchman Pierre-Felix Lagrange (1857-1928), consisted of excising (rather than simply incising) the anterior sclera in the region of the filtration angle. He called this operation sclerectoiridectomy and it involved resection of part of the anterior lip of a beveled scleral incision combined with a large iridectomy. Herbert argued that this operation had several faults, i.e. too long an incision which often gaped, excision of too large a portion of the iris, and lack of a means of regulating the size and depth of the portion of excised sclera. Herbert felt that these problems could be relieved by performing small incision sclerotomy without excision of scleral tissue. Another alternative to regulate the size of the scleral fistula was introduced by the Norwegian Soren Holth (1863-1937) who
developed a punch to excise the anterior portion of the incision rather than the scissors employed by Lagrange. (22, 23)

Herbert developed three types of sclerotomy and he was a pioneer in trying to develop a diffuse, smooth, and even filtering bleb without a grossly fistulous scleral scar. In 1907, he described the first of these as the “jagged incision” in which he aimed to secure delayed healing of the sclerotomy and thus consequent filtration by making the incision jagged or uneven by means of sawing movements with a narrow and dull Graefe knife under the conjunctiva in the region of the angle. He reported on his experience of 60 cases with this procedure, concluded that his results were “somewhat uncertain,” and abandoned it. (24)

Herbert then proposed the “wedge isolation” procedure and published this in 1908. (25) This also required an ab interno incision with the Graefe knife and subconjunctival incisions so as to isolate a wedge of corneal-scleral tissue in the angle under the conjunctiva. This wedge or prism of sclera was still attached to the conjunctiva at its base; the flow of aqueous would lift this bit of tissue from its bed, and since it was isolated from its blood supply, the tissue would shrink and allow formation of a filtering incision without actually excising any tissue. (Fig. 7) This procedure was often combined with a small basal iridectomy to prevent iris prolapse. The maneuvers of this procedure were complex and not easily understandable from Herbert’s description or drawing to explain his surgical procedures. Responding to these concerns, a year later Herbert published a further explanation of this procedure with better illustrations. He also suggested that “the technique can be easily learnt by operating on a few pig’s eyes.” However, in a later paper he admitted that the “wedge operation can never become popular, owing to the minute care required in its execution.” Robert H. Elliot, another pioneer in development of glaucoma surgery, who had the advantage of learning the procedure from Herbert himself, said it is a “tricky and difficult operation.” However, the partial success from these two procedures convinced Herbert that it was unnecessary to excise pieces of limbal or
sclera tissue to produce a permanent filtering procedure, and that a small scleral incision
allowed formation of a diffuse filtering area rather than a large, gross fistulous bleb.

Between 1907 and 1909, he then developed a new type of sclerotomy which he labeled
"small flap" incision. This procedure was performed by an ab externo incision, thus avoiding
passage of the Graefe knife across the entire anterior chamber. He inserted a Graefe knife
horizontally through the conjunctiva, limbal sclera, and into the chamber, and then by turning the
knife vertically with the sharp edge anteriorly, made two vertical incisions on either side of this
initial incision, thus producing a small rectangular flap or tongue of scleral tissue based at the
limbus under the conjunctiva. (Fig 8) By making the initial incision either shorter or longer in
length, he hoped to titrate the amount of filtration for eyes with higher or lower elevation in
pressure. For eyes with moderate glaucoma, he used a flap 1-2 mm wide, but for eyes with
severe glaucoma he made the incision 4 mm. Here he clearly enunciated his major point about
glaucoma filtration surgery, and the one that he should be remembered for: that using large
incisions for glaucoma surgery, with all the attendant problems of large or gaping incisions and
unplanned prolapse of iris, were dangerous and that the success of filtration could be achieved
by the use of small incision surgery. His objection to any type of excisional sclerectomy was that
it removed too much tissue and either produced hypotony or excessively large filtering bleb
subject to complications such as infection or rupture. He felt that his sclerotomy without
excision of tissue disturbed the eye as little as possible, produced a uniform and diffuse filtration
area rather than the large fistulous bleb, and if it failed, more extensive surgery could be
performed. (26)

His “small flap” or “trap door” sclerotomy without iris inclusion became much more
popular than his prior procedures and was tried and employed successfully by his colleagues.
Herbert followed up his original 1910 report with two more papers in 1911, and two final reports
in 1920 and 1922. The two 1911 papers also included a series done by other surgeons in
England. Herbert reported only 3 failures out of 54 cases with at least a 5 month follow up. He
and other surgeons had introduced various modifications, such as making the scleral incision
with a keratome rather than with a Graefe knife and reflecting the conjunctival flap over the
cornea to allow more deliberate incision of the scleral flap with scissors rather than the straight
Graefe knife. His final impressions (as published in 1920 and 1922) were that this operation
was useful in cases of mild to moderate glaucoma, but not as successful in advanced or severe
cases. He also felt that a period of miotic treatment should be undertaken prior to the use of
this procedure. He also was concerned about the permanency of reduction in pressure in these
cases where there was no iris included in the incision. Here we see Herbert turning away from
sclerotomy alone and moving to his iris-inclusion operation. Herbert admitted that “there has
always been something elusive in small flap sclerotomy.” Another surgeon had reported
increasing success with post-operative massage of the globe to continue to keep the filtering
wound from scarring, and Herbert agreed with this recommendation.

The drawback to all these small incision sclerotomies was that they were apt to fail
owing to healing of the small incision. On the other hand, there was some truth to Herbert’s
contention that operations such as Lagrange large incision sclerectomy or Elliott corneo-scleral
trephination which removed a defined piece of the sclera were apt to do too much and form an
excessively large filtering bleb which was likely to leak, rupture or become infected. Herbert
made a careful study of the appearance of the bleb and differentiated the desired filtration effect
with diffuse conjunctival edema formed from his operations of small incision sclerotomy or iris
inclusion, in contrast to the large and grossly fistulous blebs resulting from more extensive
removal of scleral tissue. He was very interested in the appearance and functionality of the
filtering cicatrix and performed histologic studies on postmortem eyes which had previously
undergone filtering surgery. (Fig 9)
In an effort to keep the sclerotomies from healing, he was one of the first ophthalmologists to insert various setons in the sclerotomy to try to keep them open. He first made a long conjunctival flap over the small sclerotomy and then pushed the conjunctival flap into the anterior chamber; in some eyes, he used a temporary suture to secure the flap in the incision to prevent its extrusion. However, this proved unsatisfactory after 23 cases and was abandoned. He also inserted small bits of bent capillary glass tubing, knotted threads, or a bit of wire through sclera-corneal punctures under the conjunctiva. All these attempts failed due to inflammation and eventually Herbert abandoned them. This was an idea in advance of its time and such setons are now commonly utilized.

Although Herbert thought his small flap scerotomy was useful in cases of mild glaucoma, he noted that permanent reduction of the pressure often failed due to closure of the sclerotomy so he looked for another technique. In 1903, he reported 130 cases of deliberately prolapsing the iris into a scleral incision under a conjunctival flap. This procedure grew out of observations made by himself and many other surgeons in which, following iridectomy, the best and most permanent reduction of pressure occurred when pieces of the iris by chance were entrapped and healed in the incision. Herbert and others had noted that such iris prolapses commonly occurred inadvertently following cataract extraction and this was well tolerated as long as the prolapsed iris was completely covered by the conjunctival flap. Other surgeons had tentatively proposed, and even performed a few operations with deliberate incarceration of the iris into either the corneal or scleral incision, but Herbert was the first surgeon to deliberately perform a large series of such operations. An iridectomy was also performed at the time of prolapse. He reported good success and followed 51 eyes for at least 6 months. He denied any cases of late infection, but had two cases of severe postoperative inflammation and in one of these cases, sympathetic ophthalmia occurred. However, he concluded that the relief of the tension was both certain and permanent. The only other complication was delayed reformation of the
anterior chamber in a few eyes. He called this operation subconjunctival prolapse of the iris. (Fig 10) His report was important in establishing the basis for iris inclusion operations, but clearly Herbert, at that time, did not see this as a promising lead to the ideal operation and turned to sclerotomy without iris incarceration in his different techniques as described previously. (27)

Herbert did not again write about iris incarceration surgery till 1919. It was thus left to Soren Holth to fully develop this procedure and name it “iridencleisis antiglaucomatosa.” Holth first published this in 1906 and continued with various modifications. Opposition to this procedure was common, and many condemned the idea of deliberate iris incarceration. Objections raised included the risk of sympathetic ophthalmia, induced astigmatism, and the cosmetic appearance of the updrawn pupil. Because of these concerns, and a 14% failure rate, Holth returned to the sclerectoiridectomy procedure of Lagrange, and invented his punch to help remove a standard bite of sclera rather than the use of scissors of Lagrange’s sclerectomy. Holth, like Herbert, vacillated between iris inclusion and iris free filtering procedures. Although the name of Holth is usually associated with the development of deliberate iris inclusion, it was really Herbert who first performed this procedure, published a large series of eyes, and became its major proponent. (28)

Thus, incarceration of the iris into the sclerotomy became the second basic type of filtration surgery. The third variation was corneoscleral trephination in which a small circular trephine was applied at the anterior limbus to create a scleral fistula under a conjunctival flap. First described in 1909, the originators of this procedure, Freeland Fergus (1858-1932) of Scotland and Robert H. Elliot (1866-1936) of England, claimed this as simpler to perform than a Lagrange sclerectomy and avoided deliberate iris inclusion as advocated by Holth and Herbert. This procedure soon became widely accepted and was the commonest filtration procedure performed during the first half of the 20th century. (29)
Herbert's next contribution to this subject came in 1919; the delay in publication was undoubtedly due to his four years of service during World War I. This paper describes both iris-free as well as iris-inclusion sclerotomy. He does not give any statistical data with regard to the results but seems to favor iris-inclusion as he described this technique in great detail. However, as was typical for him, he vacillates between various techniques. He mentions the use of the Schiotz tonometer in one case, but still appears to depend mostly on the use of finger tension to measure the results of his surgery. As was his habit, a year later he published a follow-up article describing his “improved iris prolapse operation” for those who could not understand his admittedly “cursory” description of surgery in the prior article. Again, Herbert has no drawing or illustration for his surgical technique; his continual failure to better illustrate his surgical technique does not make it easy for the reader to exactly understand the steps of his operation. He acknowledged several problems with his surgical procedure: induced astigmatism and often a temporary rise in pressure in the immediate postoperative period, often causing a greater bulge in the prolapsed iris. Again, no statistical results are given for the operation, but he claims a permanent, though short term result in the vast majority of cases. He now tended to utilize his small flap sclerotomy as his primary operation in moderately severe cases, and to use iris-incarceration only in more severe cases or where his first procedure had failed. With regard to the common concern of sympathetic ophthalmia following such cases, Herbert claims that in his opinion this only occurred rarely and in such eyes where the iris was not entirely covered by the conjunctiva and there was a strong presumption that the disease was introduced by problems or infection during the operation. By now he is condemning the growing popularity of the trephination operations, and is clearly now fighting a losing battle for his iris –inclusion filtration rather than the iris-free surgery performed with Elliot's trephination.
In 1923 Herbert published his text *The Operative Treatment of Glaucoma*. (32) This short text of 160 pages is disappointing in many ways, both to his contemporaries and later readers. He made no attempt to review or summarize the vast literature on glaucoma surgery. He stated that by not claiming originality in his ideas, he thus does not have to reference prior surgeons’s contributions. The text does not discuss iridectomy or other glaucoma operations such as cyclodialysis (introduced in 1905) and thus does not really cover the subject of its title.

The text is prolix, long on description of his operations and short on illustration of how to perform them. Although he was clearly familiar with the Schiotz tonometer, he apparently did not use it regularly and still refers to the use of finger tension tonometry. He described this text as a resume of papers already published but the book would have appeared more useful if the compilation would have been more complete and careful; the text is not well organized and the reader has to move back and forth to fully understand the reasons for emphasizing iris-inclusion operations rather than iris-free operations such as Elliot’s trephination. The main reason that he rejected Elliot’s trephination was that he felt the excision of the piece of sclera as too extensive surgery, with the chance of producing an excessively large and fragile bleb, subject to infections, rupture, and over-filtration; however, he admits that he has no experience with the surgery. The disagreement between Elliot and Herbert is clearly delineated in the text, and the reader forms the impression that Herbert is using his book to attack the obvious success of trephination surgery.

The book was reviewed without critical analysis in the *American Archives of Ophthalmology*. (33) The *British Journal of Ophthalmology* was much more critical of its organization and contribution to the subject, and felt it was a disappointment. (34) The most interesting reviews were in the *American Journal of Ophthalmology* in which two reviews are presented. (35) The first, by the journal’s editor, Edward Jackson, gives a one page discussion which is mildly favorable. The guest review is by Elliot who very carefully throws doubt on
Herbert’s contention that only iris-inclusion filtration gives permanent relief of glaucoma and points out the inconsistencies in many of this text’s conclusions.

In this author’s analysis, if the text been better organized and the operations advocated better illustrated, it would have been a much more useful text. This author wonders that Herbert originally hurried this text into publication because Elliot was publishing his own text in 1922, and Herbert wished to have his opinions in print simultaneously. This author hypothesizes that, based on Herbert’s brief text on cataract surgery, followed later by his much more complete book later, Herbert might have planned a much more complete glaucoma surgical book at a later date. This was typical of his publication pattern: an article, followed by a supplemental paper later. When Herbert’s text is compared to Elliot’s classic book, *A Treatise On Glaucoma*, published in 1922, Herbert’s book is clearly an inferior volume.

From 1923 till his last paper in 1934, Herbert published 6 more long articles on iris-inclusion filtration. The major points that he repeats are that iris free filtration tends to fail over time while iris-inclusion surgery tends to be a permanent cure, and he is clearly pushing for iris-inclusion surgery as more efficacious and safe compared to trephination. He is adamant that the risk of sympathetic ophthalmia is overly emphasized and that measures can be undertaken to reduce this risk. Acting on the assumption that sympathetic uveitis arises from exogenous infection at the time of surgery, he went to great lengths to prepare the eye with extensive irrigation with perchloride solution and careful aseptic technique during surgery. He claimed that the only case of sympathetic arising in his 35 years of glaucoma surgical experience developed in a patient early in his career when the thorough cleansing of the conjunctiva was not performed. He also stated that sympathetic ophthalmia only occurred in cases of iris prolapse not completely covered by the conjunctival flap. He mentioned that iris-inclusion surgery is especially suited in patients in which the contralateral eye is blind or nearly so, so as to obviate any concern over sympathetic uveitis. The use of a small incision of about 3.5 mm
reduces the chance of delayed reformation of the chamber which was commonly observed following sclerectomy or trephination with formation of a much larger fistula. He recommended performing a deliberate irido-dialysis prior to prolapsing the iris in the sclerotomy. He emphasized that iris–inclusion surgery is not suitable for eyes with active or past irido-cyclitis. In eyes with acute glaucoma, instead of performing a simple iridectomy as was the common procedure, he combined his iridectomy with deliberate incarceration of the iris into the incision.

(37)

To summarize, the period from about 1900 to 1920 saw the development of true glaucoma filtration surgery. The introduction of the Schiotz tonometer in 1905 certainly allowed a better understanding of chronic glaucoma and allowed it surgical treatment to be better understood. Multiple varieties of filtration surgery were developed, but all were variations of three basic types: Lagrange sclerectomy, iris-inclusion as proposed by Herbert and Holth, and corneoscleral trephination as championed by Elliot. The only exception to external filtration surgery was cyclodialysis, a non filtration procedure. Each of these procedures had its champions. Trephination was the most popular, followed by iridencleisis, and finally by the anterior lip sclerectomy of Lagrange and Holth. In 1924, Count Sir Luigi Preziosi (1888-1965) from Malta introduced another variation: he produced the corneoscleral fistula with a thermal cautery needle. This procedure did not enter common use till about 1950, and was made much more practical and useful by its development in 1957 by Harold G Scheie (1909-1990). Scheie called his operation peripheral iridectomy with scleral cautery and this replaced, to a large extent, all prior procedures for glaucoma filtration until the introduction and popularization of trabeculectomy in the 1960s. (21)

I have reviewed the life and work of one of these pioneers, whose contribution in the diagnosis of trachoma has perpetuated his name, and justly so, as his diagnostic acumen here was both very important and has stood the test of time. His efforts, however, in glaucoma
surgery have been forgotten. The major reason is that the operation which he proposed and
championed, iris-inclusion filtration or iridencleisis, was never fully accepted at that time, and its
basic principle is now discredited. The impact of his publications was hampered by poor
organization, a somewhat contentious and dogmatic approach, and lack of clarity and and
illustrations on how to perform his operations. However, his efforts to advance glaucoma
filtration surgery were significant. He and Lagrange were the first to insist that the filtering bleb
was the mechanism by which filtration surgery functioned, an idea not well understood when
they began their studies. By analyzing the various morphologies of the filtering bleb, and
tailoring his surgery to obtain the ideal bleb, Herbert’s observations were important. His major
point that small incision sclerotomy, either with or without iris incarceration, was a major
advance over large incision sclerectomy is still valid. His attempt to titrate the degree of surgery
to the degree of glaucoma severity was also notable, as many surgeons simply performed the
same operation on all eyes. Herbert thus holds a premier position as one of the pioneers in the
history of glaucoma surgery.

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Legends

Fig. 1. Herbert Herbert. 1865-1944. (Photograph reproduced with permission of Lady
Fiona Montagu, granddaughter of Herbert)

Fig. 2 Herbert Herbert at the Oxford Ophthalmological Congress, 1911. The arrow
identifies him. The man sitting directly behind Herbert is Sir William Osler. Although not
an ophthalmologist, he helped organize the early ophthalmological congresses.
(Photograph reproduced with permission of Richard Keeler FRCOphth (Hon))
Fig. 3 Herbert’s drawings of peripheral corneal pits in trachoma.

Fig. 4 Modern clinical photograph of Herbert’s pits.

Fig. 5 Drawing of Herbert’s pit.

Fig. 6 Trachomatous Ptosis and lid malformation.

Fig. 7 Herbert’s schematic illustration of his “corneal wedge” operation.

Fig 8. Herbert’s schematic drawing of his “small flap sclerotomy” operation.

Fig 9. Histologic slide of the “small flap operation.”

Fig 10. Herbert’s schematic drawing of healed “iris inclusion operation.”