Controversy in Ophthalmology at the Beginning of the 20th Century

Opinions Voiced in the Archives, Especially on Cataract and Glaucoma

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Volumes of the Archives of Ophthalmology from the early years of the 20th century include original articles as well as reports of proceedings of important ophthalmologic conferences held in the United States, Great Britain, and on the European continent. Original articles often provided new information, but speakers at conferences frequently offered lucid opinions on topics relevant to practitioners that were not found elsewhere in journals from that era, and these reports give us a sense of their thinking, particularly about therapeutic practices and knowledge of cataract and glaucoma.

To obtain some understanding of concepts in ophthalmology at the beginning of the last century, I read the dozen volumes of the Archives of Ophthalmology that were published from 1900 through 1911. This period includes the transition of editors from the founder of the Archives, Hermann Knapp, MD (1832-1911; editor, 1869-1911), to his son Arnold Knapp, MD (1861-1956; editor, 1911-1956). Many original articles are noteworthy, but particularly interesting are reports from conferences in which the speakers often gave candid opinions about controversial questions. Some of the topics covered remain meaningful today: progress in cataract surgery, the development of modern glaucoma surgery, refractive surgery, the difficulty of repairing retinal detachment, and early work on corneal transplantation.

CATARACT

Standard Surgical Technique

At the beginning of the 20th century, few ophthalmologists performed many cataract operations; the standard procedure was extracapsular extraction. The typical method was described in 1900 by Carlos E. Finlay, MD (1868-1944), in a report of the first 100 cataract operations he performed after beginning practice in Havana, Cuba. Finlay later became the professor of ophthalmology and dean of the medical school at the University of Havana. (His father is even more famous; he was the first individual to suggest that yellow fever is transmitted by mosquitoes.) Finlay had trained with Hermann Knapp in New York, and his technique was modeled on that of his mentor. After instilling 4% cocaine drops for anesthesia, Finlay washed the area around the eye with soap and water and then with mercury bichloride; he irrigated the conjunctiva with the same solution. He made a limbal incision superiorly for 40% to 50% of its circumference, followed by an anterior capsulotomy under the iris superiorly. (In Knapp’s experience, a central capsulotomy often led to posterior synechiae, which would make the inevitable posterior capsulotomy more difficult. Finlay later attempted to express the nucleus more difficult.) Finlay made an iridectomy if the iris was injured during the incision, if he had difficulty expressing the nucleus, or if the iris prolapsed after delivery of the nucleus. He expressed the nucleus using pressure with a Daviel spoon inferiorly and counterpressure above the incision with a wire loop. If he saw cortical material remaining, he would attempt to express it, but he did not irrigate the anterior chamber. (By 1907, Knapp had modified his technique. He would irrigate cortex or blood out of the

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anterior chamber using a glass syringe with an angular tip.\textsuperscript{3} The only illumination used was sunlight focused on the eye by a handheld lens, so it is unlikely that Finlay could see the posterior capsule. The patient remained in bed for 3 to 4 days, and the hands were tied to the foot of the bed at night. Nearly all Finlay’s patients had mature, hypermature, or complicated cataracts. His operative complications included 24% vitreous loss (mainly in his earliest cases), a high rate. (In comparison, at the ophthalmic clinic in Helsinki, Finland, vitreous loss was only 1%).\textsuperscript{5} Finlay also described 17% iris prolapse (usually due to trauma after surgery), 2% endophthalmitis, and 3% loss of the eye from inflammation. He did not mention any retinal complications. Forty-three percent of the patients subsequently required discission or excision of the posterior capsule. The final visual acuity was 20/20 to 20/30 in 15% of patients, 20/40 to 20/50 in 35%, 20/70 to 20/100 in 27%, 20/200 in 8%, and less than 20/200 in 15%.

The Intracapsular Controversy

Extracapsular surgery in 1900 had a major flaw: if the cataract was not mature, cortical material could not be removed effectively. The incidence of secondary membranes was high, so that many affected individuals needed to undergo another operation. Some surgeons attempted to ripen the cataract by various methods before removing the cataract, using a preliminary iridectomy, needleing, massage, or injection under the capsule of the lens. Major Henry Smith, MD\textsuperscript{5,6} (1859-1948), an Irish surgeon working in India, believed that he had a better solution in his method of extracting the lens within its capsule. When Hermann Knapp accepted Smith’s first article for publication, he said, “If Major Smith could perfect his operation for the extraction of the lens in its capsule he would render a greater service to humanity than that rendered by the great Daviel.”\textsuperscript{7} (Jacques Daviel, MD [1696-1762], had performed the first planned cataract extraction in 1747.) Smith was the most experienced cataract surgeon the world had ever known and had done 20,000 procedures by 1908. The advantages of the intracapsular procedure were that only 1 operation was necessary, the cataract did not need to be mature to be removed, inflammation was less common, and there was no posterior capsule to become opaque. However, it was a more difficult procedure than extracapsular surgery. In 1905, Smith\textsuperscript{5} reported on 2616 procedures during the previous year at his hospital at Jullundur, Punjab, India. He said the results were “first class” in more than 99% of cases, but he did not have long-term data since most patients disappeared into the countryside shortly after surgery. His vitreous loss rate was less than 7%.

Arnold Knapp\textsuperscript{8} visited Smith in India to learn his technique and even performed cataract operations there. Of the 104 procedures he observed or performed, the complications included vitreous loss in 13 cases, iris prolapse in 17, suppurable in 2, and choroidal hemorrhage in 2.

Captain A.E.J. Lister\textsuperscript{9} (?-1943) of the Indian Medical Service worked with Smith for a year and performed 576 operations using the Smith method. His rate of vitreous loss was 4.7%. Despite language barriers with the native population, he was able to test the vision of more than 250 of his and Smith’s patients and estimated that “the average vision obtained after this operation, provided the eye was healthy before operation, is 6/6.” Lister\textsuperscript{10} published a follow-up report of 95 patients who had undergone cataract extraction at least 1 year earlier without vitreous loss. No retinal detachment was found in any of the patients. Visual acuities were excellent and astigmatism was rarely more than 1 dioptr.

However, an unsigned editorial in the British Medical Journal\textsuperscript{11} in 1905 concluded, “we fear it will be a long time before British surgeons will be persuaded to adopt this operation, which, though it gives such incomparable results in Major Smith’s hands, most people will still regard as extremely dangerous.”

Posterior Capsulotomy

No matter how surgeons incised the anterior capsule in extracapsular cataract operations, most of the anterior capsule remained within the eye, as did the posterior capsule. Early 20th-century surgeons knew that epithelial cells would proliferate quickly and cloud the posterior capsule, creating a secondary cataract. These opaque layers were far thicker than those typically encountered by cataract surgeons today. The chief danger in opening the opaque capsule was excessive traction on the iris and ciliary processes. A thin capsule could be cut relatively easily with a knife-needle, even though many knives were not particularly sharp by today’s standards. Thick membranes required more extensive surgery than use of a single knife or 2 blades simultaneously. P.A. Callan, MD\textsuperscript{12} (dates unknown), advised excision of the center of the opacity using iridotomy scissors to minimize traction or laceration. He warned against making the corneal incision too far posteriorly because that might cause the heel of the scissors to traumatize the iris.

Smith\textsuperscript{13} believed that needling an opaque posterior capsule was far more dangerous than ordinary cataract extraction. He advocated extraction of the capsule, not just a central incision, and stated that vitreous loss should not occur with extraction, but “There may be an escape of a bead of vitreous which is of no importance.”

Cataract Miscellanea

Robert H. Elliot, MD\textsuperscript{14} (1864-1936), the famous British ophthalmologist who spent most of his career in Madras, India, described 125 cases of couching (displacement of the lens into the vitreous) that he had seen and concluded that he could think of no situation in which couching would have been preferable to extraction. The failure rate with couching was 69%, including 52 cases of iridocyclitis, 17 cases of glaucoma, 13 cases of imperfect dislocation of the lens, and 2 detached retinas. Elliot also thought he had seen many eyes that were atrophic from couching, even though the individuals denied having undergone the procedure. On the other hand, a few French ophthalmologists believed that couching might
have an occasional role. Hermen-taire Truc, MD15 (1857-1929), re-
ported 2 successes of his own and
said coughing is indicated in pa-
tients with delirium tremens and in
patients for whom the standard op-
eration on 1 eye had failed. Phot-
nos Panas, MD (1832-1903), the
professor of ophthalmology at the
Paris medical school, believed that
coughing could be done in very el-
derly patients, and he had good re-
results in 3 of them.13 Because extra-
capsular extraction was not effective
if the cataract was not mature, op-
thalmologists tried many methods
to ripen the lens, including incis-
ing the anterior capsule, massage,
iridectomy, paracentesis, and in-
jection under the anterior capsule.
Incising the anterior capsule was
often effective but sometimes rip-
ened only the anterior cortex.
Some surgeons considered this ap-
proach dangerous because it in-
cited inflammation and could raise
the intraocular pressure markedly.
Hermann Knapp concluded, “many
operators, the present writer in-
cluded, prefer the risks of remov-
ing an immature cataract to any rip-
ening operation.”16

Hjalmar Schiotz, MD (1850-
1929), recommended cleansing
the lacrimal sac with an antiseptic
solution prior to surgery. He epi-
lated the lashes before surgery and
bandaged the eye for several days
after surgery, but other surgeons
did not find these measures use-
ful.17(p199) Emile Valude, MD
(1852-1930), cleansed the conjun-
ctiva with formalin before sur-
gery.17(p195)

In 1884, Carl Koller, MD (1857-
1944), made the landmark dis-
covey that cocaine is an effective topi-
cal anesthetic agent in the eye. Soon
afterward he began to inject it sub-
conjectivally for additional effect,
and occasionally he would add pi-
larcaine to the cocaine.18 Ernst
Fuchs, MD (1851-1930), injected
cocaine mixed with adrenaline
1.1000.19 Hermann Knapp had in-
jected cocaine retrobulbarly as early
as 1884, but other surgeons encoun-
tered severe complications from
dep deep injections of cocaine. Retro-
bulbar anesthesia did not become
commonplace until the fourth de-
cade of the 20th century.

Emil Gruening, MD20 (1841-
1914), preferred a T-shaped ante-
cior capsulotomy to the cut made su-
periorly by Knapp because he had ob-
served that this reduced the need
to open the posterior capsule later.
Gruening’s approach was logical be-
cause Knapp’s method meant that
the anterior and posterior capsules
would be adherent and with little or
no exposure to the aqueous. If the
capsule was very thick centrally,
Gruening would remove the lens
with its capsule.

W.E. McKechnie, MB, ChB21(p205)
dates unknown), a surgeon in the In-
dian Medical Service, published some
suggestions for preparation as a sur-
geon: “In cataract operations more
than in any others it is desirable that
the surgeon feel fit. If the surgeon feels
ill, or tired, he should not operate for
cataract that day.” McKechnie21(p224)
written that if he had taken quinine to
treat a fever, he would often have a
fine tremor that might interfere with
his performance. Although he knew
of a prominent surgeon who opera-
ted best under the influence of al-
cohol (“Dutch courage”), he did not
recommend that approach. Instead,
his advice was, “A few drops of a dif-
 fusible drug such as ether taken in a
wine-glass full of water may be tried;
if this does not cure the stage fright a
powerful remedy is a hypodermic in-
jection of 0.008 gm of morphone.”

GLAUCOMA

At the beginning of the 20th cen-
tury there was no consensus among
ophthalmologists on the proper treat-
ment of glaucoma. Many forms of
glaucoma were recognized, includ-
ing acute, chronic, inflammatory,
hemorrhagic, and congenital, but the
distinction between angle-closure and
open-angle glaucoma was not made
until nearly 40 years later, when Otto
Barkan, MD22 (1887-1958), defined
the difference based on his work
with gonioscopy. Although pilocar-
pine and eserine (physostigmine)
were available for medical therapy,
most ophthalmologists considered
them relatively useless.23 One of the
more curious treatments recom-
manded for glaucoma was that of
Professor K.R. Wahlfors24 (1849-
1929) of Helsinki, Finland, who in-
jected strychnine.

In a symposium on glaucoma
held in 1901, Charles Bull, MD
(1844-1911), reported that there is
“complete divergence of opinion as
to the relative value of various meth-
ods of treatment”25(p56) of glaucoma
and “the question of tension is the
most difficult to settle.”25(p57) He
believed that surgery should be done
early in chronic simple glaucoma
(primary open-angle glaucoma by
21st-century terminology). Charles
Kipp, MD (1835-1911), advocated
iridectomy to treat this disease. He
described the poor results he had ob-
served with medical therapy (miot-
ics) and advised early surgery. David
Webster, MD (dates unknown),
discussed sclerotomy in glaucoma.
His experience with anterior sclero-
tomy was disappointing, for it is
“little more than a large paracentesi-
sis,”25(p80) but his one experience with
posterior sclerotomy indicated that
the procedure was promising.

William Mackenzie, MD (1791-
1868), introduced posterior sclero-
tomy in 1830, and this procedure
was used for many years. He pe-
tenrated the eye 5 to 6 mm posterior
to the limbus with a blade aimed at
the center of the eye and twisted it to
allow vitreous to escape. Early in the
20th century, many ophthalmologists
believed that if the pressure did not
decrease after an iridectomy or if in-
flammation was increasing, a scler-
otomy should be considered.26 In
1906, Arnold Knapp27(p206) pub-
lished his views on posterior sclerotomy.
He believed that the procedure was indicated in “primary acute glaucoma or chronic
glaucoma where the eye is very hard
and the anterior chamber so shallow
as not to permit a satisfactory incision.”

With the patient under general anes-
thesia, Knapp punctured the sclera
temporally with a cataract knife and
rotated the knife so that vitreous es-
caped. He did not state how far pos-
teriorly he made the incision. The eye
would soften and the anterior cham-
ber would deepen so that he could
make an iridectomy during the same
course of anesthesia. Knapp27(p335)
concluded, “Whether the operation in
the favorable cases exerted any par-
ticularly beneficial action on the glau-
comatous process, beyond permit-
ting a thorough iridectomy to be
done, is a question which cannot be
answered.”
Thomas Jonnesco, MD (dates unknown), a surgeon from Bucharest, Roumania, reported favorable results by resecting the superior ciliary ganglion in the radical treatment of glaucoma. In the discussion that followed, Panas opposed the procedure, saying the only certain result is a miotic pupil. Theodor Axenfeld, MD (1867-1930), said that sympathectomy might be tried if iridectomy failed. In 1901, spirited discussion of this procedure occurred at the Section of Ophthalmology of the New York Academy of Medicine. Some believed that the procedure was efficacious, while others described high morbidity and lack of long-term effect. Robert G. Loring, MD (1837-1888), reviewed the literature on cervical sympathectomy in glaucoma. He identified 150 cases but found no proof that sympathectomy was effective. In 1901, David Little, MD (1810-1902), described his series of 67 cases of iridectomy for primary chronic glaucoma. He stated that iridectomy was the only known cure for this disease and that it reduced tension permanently in most cases. The point was debated and respected individuals, such as William H. Wilder, MD (1860-1935), said he did not believe that anyone with chronic glaucoma ever benefitted from iridectomy; rather, many were injured by the operation. Lieutenant Colonel Herbert Herbert (1865-1942) believed that successful filtration following iridectomy was due to a gap in the incision and not the opening made in the iris.

Considerable progress in the surgical treatment of glaucoma occurred early in the 20th century when several individuals developed filtering procedures. Using a conjunctival flap, Felix Lagrange, MD (1857-1928), excised a crescent-shaped segment from the corneal side of a limbal incision into the anterior chamber. Herbert created a wedge of scleral tissue in the incision that was cut off from its blood supply and allowed filtration, while Freeland Ferguson, MD (1857-1932), and Robert H. Elliott, MD (1864-1936), were successful using trephines. All these procedures were remarkable steps on the path toward contemporary filtration procedures.

REFRACTIVE SURGERY

Several ophthalmologists reported good results in treating high myopia, generally 16 diopters or more, with clear lens extraction. William Horatio Bates, MD (1860-1931), the controversial ophthalmologist who is best known today for his popular book, *Sight Without Glasses*, reported good results. P.A. Callan, MD (1844-1932), recommended discussion followed by paracentesis as the safest method. In younger individuals, needling alone sometimes was sufficient. Because a large incision was not necessary, he noted, complications, particularly vitreous loss and retinal detachment, were less likely. W.E. Lambert, MD (dates unknown), advised needling followed a few days later by a linear extraction. A review of 338 eyes operated on for myopia at the University Eye Clinic in Leipsic (Leipzig), Germany, reported that discussion of the lens was followed by retinal detachment in 11% of eyes after extraction.

RETINAL DETACHMENT

Treatment of retinal detachment had a high failure rate at the beginning of the 20th century. The importance of closing the retinal break was not yet recognized and visualizing the peripheral retina was difficult. Jules Gonin, MD (1870-1935), described his early studies in the role of the vitreous in retinal detachment, but this preceded his description of the importance of the retinal break. Wilhelm Uhthoff, MD (1853-1927), outlined various forms of treatment. No method was established as effective, but many creative surgical techniques were tried, including retinal puncture to form a communication between the subretinal space and vitreous, scleral resection, scleral puncture in the region of the detachment, continuous drainage of subretinal fluid, electrolysis to resorb subretinal fluid and create choroidal inflammation, iridectomy, placement of irritants in the subconjunctival or subretinal spaces, scleral cautery, and injection of animal vitreous.

CORNEAL TRANSPLANTATION

Modern corneal transplantation was in the early stages of development in the early years of the 20th century. The first full-thickness graft that remained clear was made by Eduard Zirm, MD, in 1906. In a report on experiments in keratoplasty, Fritz Salzer, MD (1867-1952), stated that it was impossible to transplant a cornea from a rabbit to a man successfully but that human-to-human grafts can be successful, especially if the donor is an infant. However, in 1909, Francis Valk, MD (1845-1919), reported on transplant of a rabbit cornea to a human who had a corneal ulcer. Although the visual result was “indifferent,” the eye was not lost.

These descriptions from issues of the *Archives* a century ago show that important steps were occurring that led to our current levels of understanding. Hopefully, a century from now ophthalmologists will be able to say the same about advances that were taking place at the beginning of the 21st century.