Bulletin of the

University of Minnesota Hospitals
and
Minnesota Medical Foundation

Glaucoma

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BULLETIN OF THE
UNIVERSITY OF MINNESOTA HOSPITALS
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MINNESOTA MEDICAL FOUNDATION

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I. GLAUCOMA

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REMARKS

Glaucoma may be defined as an increase in the intraocular pressure which the eye can not tolerate without injury to its inner structures and impairment of its visual function. Glaucoma is not a disease entity but rather a whole complex of diseases which have as their common feature an abnormal elevation of the intraocular pressure.

HISTORICAL

The word glaucoma appears in the writings of Hippocrates[1] (460 - 370 B.C) and has appeared in medical literature through the years since that time. The concept of the disease associated with raised intraocular pressure is of a much later date than Hippocrates, however. Galen[2] (130 - 200 A. D.) and other writers of the early Christian centuries recognized that the morbid conditions behind the pupil which gave rise to blindness could be differentiated into two groups, cataracts which were amenable to operative treatment, and glaucomas which were not.

The first clear recognition of a separate morbid entity corresponding to our modern conception of glaucoma seems to have appeared in the writings of the Arabian Sams - ad - din[3] (? - 1348) who described among the ophthalmies a "migraine of the eye" or "headache of the pupil", an ocular disorder characterized in its acute stage by hemicrania, deepseated inflammation of the eye, and turbidity of the humors, followed occasionally by cataract and permanent dilation of the pupil. He stated that if the disease became chronic, tenseness of the eye and blindness supervened. The essential feature of raised tension was freely established by William MacKenzie[4] (1791 - 1868) who in his classical textbook ascribed the raised tension to an increase in the watery contents of the globe owing to a serous choroiditis and employed puncture of the vitreous for its relief. The introduction of the ophthalmoscope in 1851 by Helmholtz[5] (1821 - 1894) brought about the next epoch in the history of glaucoma. Now glaucomatous cupping was clinically observed. Intraocular hypertension was universally admitted to be the essential symptom of glaucoma.

CLASSIFICATION OF GLAUCOMAS

I. Congenital and juvenile primary glaucomas caused by developmental anomalies:
   - A. Congenital primary glaucoma.
     1. Hydrophthalmia.
     2. Glaucomas associated with aniridia, neurofibromatosis, etc.
   - B. Juvenile glaucoma, developmental anomalies.

II. Secondary glaucoma.
Glaucoma as a complication of some other disease or damage to the eye.

III. Primary glaucoma.
Glaucoma of unknown or poorly understood mechanism.
   - A. Open angle glaucoma. Filtration angle of the anterior chamber is of normal width.
   - B. Narrow angle glaucoma.

CONCEPTS OF PRIMARY GLAUCOMA

Aqueous humor is considered to be formed by a combination of secretion and diffusion through the blood aqueous barrier. It is formed primarily in the region of the ciliary epithelium and flows forward into the anterior chamber. and escapes from the eye at the filtration angle into Schlemm's canal and then into aqueous veins and venous channels. The aqueous is in a steady state of motion or flow.[6] Interference with the formation of aqueous, its circulation through the eye or its exit from the eye will result in an alteration in the intraocular tension.

Practically all theories of the etiology and mechanism of primary glaucoma are concerned with a disturbance in the exit of aqueous from the eye. There are two outstanding schools of thought among these theories and each school has numerous and prominent supporters. These schools are the neurovascular school and the mechanical school.

It is the neurovascular school of thought on which the old classification of primary glaucoma was based. This is the classification on which most of us were brought up, namely:

1. Acute congestive glaucoma (or acute uncompensated).
2. Chronic congestive glaucoma (or chronic uncompensated)
3. Chronic simple glaucoma (or compensated).

The leading proponent of the neurovascular school is Sir Stewart Duke-Elder[7] and he feels that the primary disturbance in congestive glaucoma is a capillary stasis in the ciliary region with increased permeability and edema and a secondary narrowing of the filtration angle of the anterior chamber with a rise in tension. The primary disturbance is thought to be a vascular imbalance and probably neurovascular. Many believe that disturbances in the parasympathetic nervous system,[8] the sympathetic nervous system[9] and the central nervous system[10] may be factors in glaucoma. Others believe in hormonal factors.[11]

The mechanical theory of the origin of primary glaucoma had its inception in 1923 when Raeder[12] suggested a classification of glaucoma based on the depth of the anterior chamber. Barkan[13] presented a classification of glaucoma in 1938 based on the state of the angle of the anterior chamber as observed with the gonioscopic lens. With the advance in gonioscopic technique it has become more apparent that cases of primary glaucoma fall into two separable groups; those with narrow anterior chamber angles, and those with anterior chamber angles of normal depth. Supporters of the mechanical theory of primary glaucoma feel that the iris root blocks the filtration angle before the elevation of intraocular tension occurs and brings about the subsequent elevation of tension. The narrow angle state of these eyes is thought to be the primary predisposing factor. With attacks of increased pressure and filtration angle closure peripheral anterior synechia form and the filtration angle blockage gradually becomes permanent. The accumulated evidence of many investigators through anatomic and gonioscopic studies in support of the mechanical theory led the symposium panel[14] on primary glaucoma at the 1948 meeting of the American Academy of Ophthalmology and Otolaryngology in which Vail, Friedenwald, Kronfeld, Scheie, Dunnington, and Chandler participated, to adopt unanimously the classification of primary glaucoma into narrow angle and wide angle types, as proposed by Raeder[12] in 1923.

METHODS OF EXAMINATION FOR GLAUCOMA

TONOMETRY

To the ophthalmologist tonometry means the measurement of the resistance of the eyeball to deformation by forces applied to the surface of the eye. The object of this measurement is to arrive at an estimate of the intraocular pressure. The three factors which cause the eyeball to resist an external deforming force are; (1) the intraocular pressure (2) the resistance of the eyeball wall to deformation and stretching, and (3) the resistance of the liquid ocular contents to displacement. The presence of the second factor makes tonometry a complicated and involved matter. Dr. J. Friedenwald[15] has advocated the term "ocular rigidity" for this factor and has devised methods of determining it.

In the development of clinical tonometry freshly enucleated human eyes were subjected to simultaneous tonometric and monometric measurements. In a representative group of eyes the

tonometric and monometric readings for difference intraocular pressures were correlated so that standards in terms of mm. of mercury could be set up for tonometric readings.

The mechanical principles of tonometer now in use is either to measure the depth of the indentation produced by a constant deforming force or to increase in a deforming force until an indentation of a certain depth is produced. Tonometers which measure the depth of indentation of the cornea by a known force are the Schiøtz, McLean, and Gradle tonometers. The Sauter tonometer is one based on the principle measuring the force needed to indent the cornea a given amount. In this instrument a freely movable plunger connected to a helical spring is applied to the cornia horizontally. The pressure is increased until the slightest recognizable indentation of the cornea is produced.

There is no way of arriving at a normal figure for intraocular tension because eyes vary in the amount of intraocular pressure they can maintain and not lose function. There is evidence to the effect that in eyes with average ocular rigidity and an intraocular tension consistently between 27 and 31 mm. of mercury (Schiøtz) that approximately 40 per cent of these eyes show signs of glaucomatous atrophy within two years. The lower limits of normal intraocular tension are probably around 15 mm. of mercury.

PERIMETRY

Perimetry is of extreme importance in the diagnosis of glaucoma and as a method of following the clinical course of the disease. Although there must necessarily be a stage when a patient has glaucoma before visual field changes appear, nevertheless one of the early diagnostic findings in glaucoma is a general constriction of the visual field as measured with the 1 mm. white test object at a distance of 2000 mm. This isopter normally passes temporal to the blind spot but early in the course of glaucoma the isopter falls inside of the normal blind spot or nasal to the blind spot. Following this the typical nasal step in the visual field develops and then the accurate scatoma arching over the fixation point from the blind spot. Traquair[16] states that it is largely to the investigation of the field changes in glaucoma that perimetry itself owes its development.

GONIOSCOPY

The filtration angle of the anterior chamber is impossible to observe by the ordinary methods of examination because of the opaque edge of the sclera which extends over the periphery of the iris and the semi-opaqueness of the transitional limbus. Salzmann was the first to use a contact glass to examine the filtration angle. There are two types of gonioscopic contact lenses used. One type is the hemispheric contact lens which is placed in the cornea and the observer looks across the eye into the filtration angle on the opposite side. Focal illumination is used and a microscopic lens system which gives a magnification of 15 to 20 diameters is used. Two lenses of this type are the Koeppe lens and the Troncoso lens. The other type of gonioscopic lens is a contact lens which is cut so that on one or more sides there is a place mirror or totally reflecting prism and the angle of the anterior chamber is observed in the mirror on the opposite side of the eye. Lenses of this type are the Goldmann lens and the Allen lens. With this type of contact lens in the eye the filtration angle is studied with the slit lamp.

In the normal eye with the gonioscope one sees the face of the iris, the anterior edge of the ciliary body, the scleral spur, and Schlemm's canal covered by the trobeculum. The depth of the angle can be studied and it can be determined whether the angle is blocked by the root of the iris. If the angle is closed by peripheral anterior synechia these adhesions can be observed. Information gained can be used in

deciding what type of surgery is most likely to be successful. Gonioscopy also aids in determining a favorable sight for a trephine, iridencleisis, or cyclodialysis. Gonioscopic findings seem to support the mechanical theories of the etiology of primary glaucoma.

TONOGRAPHY

It is well known that massage of an eye lowers the intraocular pressure. If an eye is subjected to repeated tonometry at short intervals each reading is a little lower than the previous one. This lowering of intraocular pressure is more marked in a normal eye than in a glaucomatous eye. The reason the pressure falls is that aqueous is forced or squeezed out of the eye. Tonography is a measure of the rate of outflow of aqueous from the eye during prolonged tonometry. A tonometer is held on the eye constantly for a period of from 4 to 6 minutes. From the rate at which the intraocular tension falls during this period and the calculated volume displacement of the aqueous by the indented cornea for various tension readings, the rate of aqueous fluid outflow from the eye can be calculated. The apparatus used is an electronic Schiøtz tonometer electrically connected to an amplifier and recording galvanometer in such a manner that all measurements made by the tonometer are continuously and automatically recorded on a moving paper strip, such as employed in a electrocardiography. From these data are determined the steady state pressure, the pressure during the measurement procedure and the volume of fluid expressed from the eye. The rate of volume loss is proportional the the increment of pressure above the steady state pressure. A coefficient for the facility of aqueous humor outflow is calculated in terms of cubic mm. per minute per mm. of mercury of pressure. The average value for normal eye[17] is 0.243. From this coefficient and the steady state intraocular pressure is calculated the rate of outflow under steady state conditions, this rate being considered equal to the net rate of aqueous humor formation under these conditions. Values for normal eyes[17] varies from 2.3 to 5.4 cubic mm. with an average of 3.66 cubic mm. per minute.

Besides its use as a research tool tonography is useful in the diagnosis of early glaucoma, following the course of medical therapy, investigation of unusual cases such as low tension glaucoma, and in the evaluation of anti-glaucoma surgery. Important work in tonography has been done by W. Morton Grant.[17]

TREATMENT OF GLAUCOMA

Because any rational treatment of a disease should be directed primarily at the cause of the disease and secondarily against the manifestations of its symptoms the treatment of glaucoma must still be considered unsatisfactory. In general the treatment of glaucoma is aimed at keeping the intraocular tension within a normal range and regulating the patients hygiene and habits so as to promote general good health.

Medical Methods of Treatment

The drugs used topically in glaucoma act primarily because of their miotic action although they may also have some effect due to their promotion of circulation secondary to their vasoilator action.

Pilocarpine is a drug that has been used in the treatment of glaucoma since 1877. It acts by stimulating the end organ of the parasympathetic nervous system and in this case the sphincter muscle fibers of the iris causing a miosis. It is used in aqueous solution of either the nitrate or chloride salt. It is used in strengths of from .5% to 4% solutions and the miosis produced by one application lasts about six hours. Pilocarpine can be used over long periods of time without producing irritation.

Eserine (physostigmine) is a commonly used drug in glaucoma and acts by inhibiting cholineesterase so that acetylcholine acts uninterruptedly. The

acetylcholine acts on the muscle fibers of the sphincter causing miosis. The cholineesterase is not destroyed but only temporarily blocked. Eserine is a more powerful and longer acting miotic than pilocarpine. The miosis lasts for some 12 hours. It is used as the salicylate in from .2% to .5% solution or ointment. Constant use commonly leads to irritation, allergic conjunctivitis, and dermatitis.

Doryl (carcholine, carbaminoylcholine). This drug is one of the choline family but is longer acting than choline and mecholyl. It is used in from .5% to 1% solution and is most effective if used with a wetting agent such as benzalkonium chloride.

DFP (diisopropyl fluorophosphate). This is a very potent miotic and the miosis produced lasts for days. It acts by destroying the cholineesterase so that the choline acts without check until new cholineesterase is produced. It is used in oil in concentration of from .01% to .2% solution. It has the disadvantage in that it frequently produces severe cramping pain due to its powerful action on the ciliary body. It is used most satisfactorily in blaucoma in aphakic eyes.

Diamox (acetazoleamide). It was found that the bicarbonate concentration was higher in the region of the ciliary body than in the anterior chamber. The concept of bicarbonate secretion in the formation of aqueous humor suggests that inhibition of the enzyme carbonic anhydrase will decrease the rate of aqueous formation. The carbonic anhydrase inhibitor Diamox has been tried and found to lower intraocular tension both in normal and glaucomatous eyes. The mode of action of Diamox is not established. It does not alter the facility of outflow of aqueous and is thought to lower tension by reducing the rate of aqueous formation. It is used in conjunction with miotics and is most useful in overcoming acute attacks of marked elevation of tension. It is used orally in 250 mg. doses from two to four times a day. It may also be used intravenously.

SURGICAL TREATMENT OF GLAUCOMA

Iridectomy - Complete basal iridectomy in which a complete segment of the iris is excised is the first operation devised for glaucoma. It was first done by Von Graefe and his original article appeared in 1857. Complete iridectomy is now reserved for patients with acute glaucoma which does not respond to medical treatment. The rationale of the reduction of the tension is still a matter of controversy, and many theories have been advanced since Von Graefe's original suggestion that removal of part of the iris diminished the secretion of aqueous. The most likely explanation is that the operation makes a free opening from the posterior chamber to the anterior chamber thus facilitating the flow of aqueous and preventing the aqueous in the posterior chamber from balooning the iris against the filtration angle and blocking absorption of aqueous.

Basal peripheral iridectomy is at the present time becoming a popular operation in shallow angle glaucoma. The operation is done early before peripheral anterior synechia are formed. By doing the operation the iris bombé effect which is present in narrow angle glaucoma is prevented and tension is controlled.

OPERATIONS TO ESTABLISH EXTRAOCULAR DRAINAGE

Corneao-scleral trephine - In this operation a filtering scar is produced by making a trephine opening at the limbus under a flap of conjunctiva and doing a peripheral iridectomy through the trephine opening. The aqueous drains out under the conjunctiva and is absorbed. In spite of many disadvantages the operation has been a very popular one and is still used widely.

Iridencleisis - In this operation a filtering scar is produced by bringing the iris out of the eye at the limbus, cutting the iris from border to root and

incarcerating the two tails of iris under Tenon's capsule and conjunctiva. The iris tissue acts as a wick and keeps the filtering scar draining. This operation has been widely used in the past and is still widely used.

OPERATIONS TO ESTABLISH PATHS FOR INTRA-OCULAR DRAINAGE

Cyclodialysis - This is an operation conceived by Heine in 1905. It depends on making a communication between the anterior chamber and the supra-choroidal space where because of the vascularity the aqueous is readily absorbed. The operation is done by making an opening in the sclera behind the ciliary body. A spatula is passed between the sclera and ciliary body into the anterior chamber. The operation is used commonly in cases of glaucoma in aphakic eyes.

Goniotomy - This is an operation in which the filtration angle of the anterior chamber is opened by passing a knife across the anterior chamber into the angle and opening the angle with a sweep of the knife. It is of value only in wide angle types of glaucoma and is used most commonly now in treating congenital glaucoma.

OPERATIONS TO DECREASE THE FORMATION OF AQUEOUS

Cyclodiathermy - The ciliary body is damaged by trans-scleral diathermy. The electrode is placed over the ciliary body for ten seconds or so. Several points of diathermy action are placed over the ciliary body. This operation seems to have its greatest value in cases of hemorrhagic glaucoma.

GENERAL CONSIDERATIONS

The importance of early diagnosis of glaucoma is recognized by all because effective treatment depends almost entirely upon the early recognition of the condition. Each year as medical science stretches man's life span, glaucoma becomes a more serious problem because it usually strikes the older age groups and is thus finding more victims. The early symptoms of chronic glaucoma are extremely vague. The general practitioner is in a good position to help in the control of blindness due to glaucoma because he sees these patients early and more frequently than the ophthalmologist. He should be suspicious of glaucoma in patients with rapidly increasing presbyopia, fleeting obscuration of vision, occasional presence of halos, a family history of glaucoma, eye discomfort after a stay in the dark (as in a movie), poor dark adaptation, etc. It has been recommended by Zeller and Christensen[18], and I agree with them, that tonometry be made a routine part of every physical examination. There are 20,000 persons in this country who are totally blind from glaucoma (15 per cent of the blind population) and there are another 150,000 who are blind in one eye from glaucoma.[19] There is an estimated one million persons in this country who have chronic glaucoma but do not know it.[20] Although exceptions do occur, without treatment the disease is progressive and results in absolute blindness. In the average case the end-result depends essentially on two factors, the stage at which the patient comes under treatment, and the sustained adequacy of the treatment. It is impossible to give an accurate prognosis on primary glaucoma but under adequate treatment in about 70% of the cases the disease would probably be adequately controlled and stabilized, 20% of the patients would slowly deteriorate but retain sight until death, while 10% would do badly and become blind.[21]

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II. MEDICAL SCHOOL NEWS

Coming Events

May 16 - 21	Continuation Course in Proctology for General Physicians
May 18	Minnesota Medical Alumni Faculty-Student Luncheon; Junior Ballroom, Coffman Memorial Union; 12:15 p.m.
May 23	Minnesota Medical Foundation Annual Luncheon; Junior Ballroom, Radisson Hotel; 12:30 p.m.
May 23 - 25	Minnesota State Medical Association Annual Meeting; Minneapolis Auditorium.
May 26 - 28	Continuation Course in Surgery for General Surgeons.

* * *

Dr. Visscher Receives Cancer Award

Dr. Maurice B. Visscher, Professor and Head of the Department of Physiology, was named the winner of the 1955 American Cancer Society medal for Minnesota at a meeting of the Board of Directors of the Minnesota Division of the Society which was held last Friday evening, May 6. The presentation was made by Dr. David P. Anderson of Austin, President of the Society's Minnesota Division, and was "awarded in recognition of Dr. Visscher's important contributions to the control of cancer." Previous medal winners in Minnesota include Doctors Owen H. Wangensteen, John J. Bittner, Arthur Kirschbaum, E. T. Bell, Arthur H. Wells, and Mr. Louis W. Hill, Jr.

* * *

Continuation Course

The University of Minnesota announces a continuation course in Surgery for General Surgeons which will be held at the Center for Continuation Study on the Minneapolis Campus from May 26 to 28. The program, which will be of interest primarily to those whose practices are mainly or exclusively surgical, will deal extensively with a limited number of subjects: preoperative and postoperative care including electrolyte problems, tumor problems, and intestinal obstruction. A surgical forum will be held in which briefer consideration will be given to very recent advances in various aspects of surgery. The program will be presented under the direction of Dr. O. H. Wangensteen, Professor and Chairman, Department of Surgery.

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Faculty News

Dr. Ancel Keys, Professor and Director, Laboratory of Physiological Hygiene, has recently returned from South Africa and Italy where he carried out extensive field research in arteriosclerosis.

Dr. Paul Frick, Instructor, Department of Medicine, presented a paper entitled "Circulating Anticoagulants in Clinical Medicine" at the meeting of the Section on Blood and Allied Problems of the National Research Council in Washington, D. C. on April 19.

Dr. David Glick, Professor of Physiological Chemistry, attended the first Conference on Polysaccharides in Biology sponsored by the Josiah Macy, Jr. Foundation, from April 27 to 29 at Princeton University, as an invited participant.

III. UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
WEEKLY CALENDAR OF EVENTS

Physicians Welcome

May 16 - 21, 1955

Monday, May 16

Medical School and University Hospitals

9:00 - 9:50 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.

9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; W-612, U. H.

10:00 - 12:00 Neurology Rounds; A. B. Baker and Staff; Station 50, U. H.

11:30 - Tumor Conference; Doctors Hitchcock, Zimmermann, and Stenstrom; Todd Amphitheater, U. H.

12:15 - Obstetrics and Gynecology Journal Club; Staff Dining Room, U. H.

12:30 - Physiology Seminar; 214 Millard Hall.

1:00 - 2:00 Roentgenology-Surgical-Pathological Conference; Paul Lober and L. G. Rigler; Todd Amphitheater, U. H.

1:30 - 2:30 Pediatric-Neurological Rounds; R. Jensen, A. B. Baker, and Staff; U.H.

1:30 - 3:30 Dermatology Hospital Rounds; H. E. Michelson and Staff; Dermatology-Histopathology Room, C-394, Mayo Memorial.

4:00 - 6:00 Anesthesiology Conference; F. H. Van Bergen and Staff; Todd Amphitheater, U. H.

4:30 - Public Health Seminar; Use of Closed Circuit Color Television in the Education and Training of Medical and Allied Scientific Fields; Major General Alvin L. Gorby, Walter Reed Army Medical Center; 100 Mayo Memorial.

4:30 - Pediatric-Medicine Infectious Disease Rounds; Stations 33, U.H.

5:00 - 6:00 Urology-Roentgenology Conference; C. D. Creevy, O. J. Baggenstoss, and Staff; Eustis Amphitheater.

Ancker Hospital

8:00 - 9:00 Pediatric Contagion Rounds; Richard Lein; Contagion 5.

8:30 - 10:30 Medical and Surgical Chest Conference; Dr. Gehlen and Staff; Auditorium.

9:30 - 12:00 Visiting Staff Rounds.

10:00 - 12:00 Surgery Grand Rounds; Begin Floor E4.

11:00 - 12:00 Pediatric Rounds; Harry Orme; Contagion 1.

12:30 - 2:30 Surgery Out-Patient Clinic; Room 8.

Monday, May 16 (Cont.)

Ancker Hospital (Cont.)

2:00 - 3:00 Routine EKG Interpretation; Dr. Sommers and House Staff; Medical Record Library.

2:30 - 3:00 Discussion of Problem Case; Auditorium.

3:00 - 4:00 Surgery Journal Club; Classroom.

3:00 - 4:00 Lectures on Electrocardiography; Ben Sommers; Auditorium.

4:00 - 5:00 Medical Clerk Journal Club; Auditorium.

Minneapolis General Hospital

10:30 - 12:00 Medicine Rounds; Thomas Lowry and Staff; Station 11.

10:30 - Orthopedic and Fracture Rounds; Drs. John Moe and O.J. Campbell; Station 20.

11:00 - Pediatric Case Discussions; Erling Platou; Station 8.

12:30 - Surgery Grand Rounds; O. J. Campbell, Station 21.

1:30 - 2:30 Tuberculosis Conference; J. A. Myers; Station 8.

2:00 - Pediatric Rounds; William Krivit; Stations 4, 5, & 6.

Veterans Administration Hospital

9:30 - Infectious Disease Rounds; Drs. Hall, Zinnemann, and Doe.

1:30 - Cardiac Conference; Drs. Smith, J. Brown, Hoseth, Simonson, and Farquhar; Conference Room, Bldg. I; Rounds immediately following conference.

Tuesday, May 17

Medical School and University Hospitals

9:00 - 9:50 Roentgenology-Pediatric Conference; Samuel Feinberg, John A. Anderson and Staffs, Eustis Amphitheater, U. H.

12:30 - 1:20 Pathology Conference; Autopsies; J. R. Dawson and Staff; 104 Jackson Hall.

12:30 - Bacteriology and Immunology Seminar; Effect of Heating Milk and Milk Powders on the Growth of Lactic Acid Cultures (Progress Report); William Green; 1050 Mayo Memorial.

12:30 - 1:30 Physiological Chemistry Seminar; The Biochemistry of the Mitotic Spindle; Robert McKinnell; 214 Millard Hall.

12:30 - Anatomy Seminar; Quantitative Histochemical Studies on the Adrenal; David Glick; 226 Jackson Hall.

3:30 - General Physiology Seminar; 323 Zoology Building.

3:30 - Pediatric Seminar; Subject to be announced; Dr. Berendes; 1450 Mayo Memorial.

4:00 - 5:00 Pediatric Rounds on Wards; John A. Anderson and Staff; U. H.

Tuesday, May 17 (Cont.)

Medical School and University Hospitals (Cont.)

4:00 - 5:00 Physiology-Surgery Conference; Todd Amphitheater, U. H.

4:30 - 5:30 Clinical-Medical-Pathological Conference; Todd Amphitheater, U. H.

5:00 - 6:00 X-ray Conference; Presentation of Cases by University Hospital Staff; Eustis Amphitheater, U. H.

Ancker Hospital

8:00 - 9:00 Pediatric Rounds; Dale Cumming; Contagion 1.

9:00 - 10:30 Visiting Staff Rounds.

9:00 - 12:00 Practical Diagnostic Clinic; Harry Orme; Out-Patient Department.

11:00 - 12:00 Medical X-ray Conference; J. R. Aurelius; Auditorium.

2:30 - 4:00 Routine EKG Interpretations; Resident Staff.

4:00 - 5:00 Medical-Pathological Conference; W. F. Mazzitello, Auditorium.

Minneapolis General Hospital

9:30 - Pediatric Rounds; Elizabeth Lowry and A. Bridge; Station 5.

9:30 - 10:30 Obstetrics and Gynecology Staff Rounds; William P. Sadler and Staff; 301 Harrington Hall.

10:00 - Psychiatry Grand Rounds; R. W. Anderson, Station 3.

12:30 - 2:30 Dermatology Rounds on Clinic; Carl W. Laymon and Staff.

1:00 - Tumor Clinic; Drs. Eder, Coe, and Lipschultz; Classroom.

Veterans Administration Hospital

7:30 - Anesthesiology Conference; Surgical Conference Room, Bldg. 43.

8:30 - Surgery Journal Club; Conference Room, Bldg. I.

9:30 - Surgery-Pathology Conference; Conference Room, Bldg I.

10:30 - Surgery-Tumor Conference; D. Ferguson and J. Jorgens.

1:00 - Review of Pathology, Pulmonary Tuberculosis; Conference Room, Bldg. I.

1:30 - Combined Medical-Surgical Chest Conference; Conference Room, Bldg. I.

2:00 - 2:50 Dermatology and Syphilology Conference; H. E. Michelson and Staff; Bldg. III.

4:00 - Thoracic Surgical Problems; Conference Room, Bldg. I.

5:30 - Physiology Seminar; Surgical Conference Room, Bldg. 43.

Wednesday, May 18

Medical School and University Hospitals

11:00 - 12:00 Pathology-Medicine-Surgery-Pediatrics Conference; Todd Amphitheater, U. H.

Wednesday, May 18 (Cont.)

Medical School and University Hospitals (Cont.)

12:30 - 1:30 Radioisotope Seminar; Austin Yates and Roy Toyama; Betatron Room in Cobalt Underground Section, U. H.

*12:30 - Minnesota Medical Alumni Faculty-Student Luncheon; Junior Ballroom, Coffman Memorial Union.

1:00 - 2:00 Dermatology Clinical Seminar; F. W. Lynch; 300 North Clinic.

1:30 - 3:00 Pediatrics Allergy Clinic; Albert V. Stoesser and Lloyd Nelson; W-211, U.H.

3:30 - 4:30 Dermatology-Pharmacology Seminar; 3rd Floor Conference Room, Heart Hospital.

4:30 - 5:50 Dermatology-Infectious Disease Seminar; 3rd Floor, Conference Room, Heart Hospital.

5:00 - 6:00 Radiology Residents' Lecture; Congenital Heart; Joseph Jorgens; Todd Amphitheater, U. H.

5:00 - 5:50 Urological-Pathological Conference; C. D. Creevy and Staff; A503, Mayo Memorial.

5:30 - 7:30 Dermatology Journal Club and Discussion Group; Hospital Dining Room.

7:30 - 9:30 Dermatology Seminar; Review of Interesting Slides of the Week; Robert W. Goltz; Todd Amphitheater, U. H.

Ancker Hospital

8:30 - 9:30 Clinico-Pathological Conference; J. Noble; Auditorium.

11:00 - 12:00 Pediatric and Contagion Rounds; Harry Orme; Contagion 1.

11:00 - 12:00 Medicine Resident Rounds; W. F. Mazzitello.

3:00 - 5:00 Infectious Disease Rounds; Auditorium.

Minneapolis General Hospital

10:30 - 12:00 Medicine Rounds; Thomas Lowry and Staff; Station 31.

11:00 - Pediatric Rounds; Erling Platou and Richard Raile; Station 6.

12:00 - Surgery-Physiology Conference; O. J. Campbell and E. B. Brown; Classroom.

12:30 - Pediatrics Staff Meeting; Classroom, Station 4.

Veterans Administration Hospital

8:30 - 10:00 Orthopedic X-ray Conference; E. T. Evans and Staff; Surgical Conference Room, Bldg. 43.

8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker.

9:00 - Gastro-Intestinal Rounds; Drs. Wilson, Zieve, Ferguson, Brakel, Vennes, Nesbitt and Sadoff.

* Indicates special meeting. All other meetings occur regularly each week at the same time on the same day. Meeting place may vary from week to week for some conferences.

Wednesday, May 18 (Cont.)

Veterans Administration Hospital (Cont.)

10:30 - Psychosomatic Conference; C. K. Aldrich; 7th Floor, Bldg. 43.

12:30 - Medical Journal Club; Doctors' Dining Room.

12:30 - X-ray Conference; J. Jorgens; Conference Room, Bldg. I.

1:30 - 3:00 Metabolic Disease Conference; Drs. Flink and Shapiro.

3:30 - Urology Pathology Slide Conference; Dr. Gleason; Conference Room, Bldg. I.

7:00 - Lectures in Basic Science of Orthopedics; Conference Room, Bldg. I.

Thursday, May 19

Medical School and University Hospitals

9:00 - 11:50 Medicine Ward Rounds; C.J. Watson and Staff; Room 3.148 Mayo Memorial.

11:00 - 12:00 Cancer Clinic; K. Stenstrom, B. Zimmermann; Todd Amphitheater, U. H.

12:30 - 1:30 Physiology Seminar 210; Transport; Selected Topics in Advanced Permeability; Nathan Lifson; 214 Millard Hall.

1:30 - 4:00 Cardiology X-ray Conference; Heart Hospital Theatre.

4:00 - 5:00 Anesthesiology Seminar; F. H. Van Bergen and Staff; Room 100, Mayo Memorial.

5:00 - 6:00 Radiology Seminar; Stricture of the Mid-Gallbladder; Sewell Gordon; Eustis Amphitheater, U. H.

7:30 - 9:30 Physiology 211 Seminar; Selected Topics in Heart and Circulation; Hemodynamics; M. B. Visscher and Robert Evans; 271 Lyon Laboratories.

Ancker Hospital

9:00 - 10:00 Pediatric Contagion Rounds; Alexander Stewart, Contagion 5.

9:30 - 10:30 Medical Grand Rounds; Auditorium; Visiting Staff Rounds immediately following Grand Rounds.

11:00 - 12:00 Medicine Resident Rounds; W. F. Mazzitello.

2:00 - 3:00 Routine ECG Interpretation; Ben Sommers; Medical Record Library.

Minneapolis General Hospital

9:30 - Neurology Rounds; Heinz Bruhl; Station 4.

10:00 - Psychiatry Grand Rounds; R. W. Anderson and Staff; Station 3.

11:30 - 12:30 Clinical Pathological Conference; John I. Coe; Classroom.

12:30 - 2:30 Dermatology Rounds and Clinic; Carl W. Laymon and Staff.

1:00 - Fracture X-ray Conference; Drs. Campbell and Moe; Classroom.

Veterans Administration Hospital

8:00 - Experimental Surgery Laboratory Meeting; Conference Room, Bldg. I.

Thursday, May 19 (Cont.)

Veterans Administration Hospital (Cont.)

8:30 - Hematology Rounds; Drs. Hagen and Duryea.

9:00 - Surgery Grand Rounds; Conference Room, Bldg. I.

9:00 - Surgery Ward Rounds; D. Ferguson and Staff; Ward 11.

11:00 - Surgery-Roentgen Conference; J. Jorgens; Conference Room, Bldg. I.

1:00 - Infectious Disease Conference; Conference Room, Bldg. I. (Rounds immediately following conference).

4:00 - 5:00 Seminar on Radioisotopes in Medicine; Clinical Applications of Radioisotopes; Conference Room, Bldg. I.

Friday, May 20

Medical School and University Hospitals

8:00 - 10:00 Neurology Grand Rounds; A. B. Baker and Staff; Station 50, U. H.

9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U.H.

10:30 - 11:50 Medicine Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.

11:00 - 12:00 Vascular Rounds; Davitt Felder and Staff Members from the Departments of Medicine, Surgery, Physical Medicine, and Dermatology; Eustis Amphitheater, U. H.

11:45 - 12:50 University of Minnesota Hospitals Medical Staff Meeting; Studies on Radiation Effects of Malignant Tumors; Halvor Vermund and K. W. Stenstrom; Powell Hall Amphitheater.

1:00 - 2:50 Neurosurgery-Roentgenology Conference; W. T. Peyton, Harold O. Peterson and Staff; Todd Amphitheater, U. H.

1:00 - 2:00 Physiology Seminar 212; Selected Topics in Respiration: Respiratory and Circulatory Effects of Hypothermia; E. B. Brown; 214 Millard Hall.

1:30 - 2:30 Dermatology Grand Rounds; Presentation of Cases from Grouped Hospitals (University, Ancker, General and Veterans) and Private Offices; H. E. Michelson and Staff; Eustis Amphitheater, U. H.

2:30 - 4:00 Dermatology Hospital Rounds; H. E. Michelson and Staff; Begin at Dermatological Histopathology Room, C-394 Mayo Memorial.

3:00 - 4:00 Neuropathological Conference; F. Tichy; Todd Amphitheater, U. H.

3:30 - 4:30 Dermatology-Physiology Seminar; 3rd Floor Conference Room, Heart Hospital.

4:00 - 5:30 Chest X-ray Conference; Chest Staff and Charles Nice; Todd Amphitheater, U. H.

4:30 - 5:20 Ophthalmology Ward Rounds; Erling W. Hanson and Staff; E-534, U. H.

5:00 - Urological Seminar and X-ray Conference; A-503, Mayo Memorial.

Ancker Hospital

8:00 - 9:00 Pediatric Rounds; Charles Steinberg, Contagion 1.

Friday, May 20 (Cont.)

Ancker Hospital (Cont.)

10:30 - 11:30 Pediatric Contagion Rounds; Richard Smith; Contagion 1.

11:00 - 12:00 Contagion Rounds; Harry Orme; Contagion 5.

2:00 - 3:00 Routine EKG Interpretation; Resident Staff.

3:00 - 4:00 Medical-Surgical-Pathological Conference; Auditorium.

4:00 - 5:00 Medical Journal Club; Conference Room, E5.

4:00 - 5:00 X-ray Surgery Conference; Auditorium.

Minneapolis General Hospital

10:00 - Otolaryngology Conference; Robert A. Priest, Large Classroom.

10:30 - Pediatric Surgical Conference; Tague Chisholm and B. Spencer; Classroom, Station 4.

12:00 - Surgery-Pathology Conference; Drs. Campbell and Coe; Classroom.

1:00 - 2:00 ECG Conference; Boyd Thomes and Staff; Classroom, Station 4.

2:00 - 4:00 Clinical-Medical Conference; Thomas Lowry; Classroom, Station 8.

Veterans Administration Hospital

10:30 - 11:20 Medicine Grand Rounds; Conference Room, Bldg. I.

11:00 - 12:30 Psychiatry Case Conference; Werner Simon; Psychiatry Department, VA Hospital Annex.

12:30 - Urology X-ray Conference; X-ray Department.

1:00 - CPC Conference; Conference Room, Bldg. I.

2:00 - Pathology Slide Conference; E. T. Bell; Conference Room, Bldg I.

Saturday, May 21

Medical School and University Hospitals

7:45 - 8:50 Orthopedic X-ray Conference; W. H. Cole and Staff; M-109, U. H.

9:00 - 9:30 Pediatric Grand Rounds; Eustis Amphitheater, U. H.

9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; Heart Hospital Amphitheater.

9:15 - 10:00 Surgery-Roentgenology Conference; Alexander R. Margulis, Owen H. Wangensteen and Staff; Todd Amphitheater, U. H.

10:00 - 11:30 Surgery Conference; Todd Amphitheater, U. H.

10:00 - 12:50 Obstetrics and Gynecology Rounds; J. L. McKelvey and Staff; Station 44, U. H.

10:00 - 12:00 Otolaryngology Seminar on Current Literature; L. R. Boies and Staff; Todd Memorial Room, A-675, Mayo Memorial.

Saturday, May 21 (Cont.)

Ancker Hospital

8:30 - 9:30 Surgery Conference; Auditorium.

9:30 - 11:00 Medicine Grand Ward Rounds; W. F. Mazzitello.

11:00 - 12:00 Medical Clerk Case Conference; W. F. Mazzitello.

Minneapolis General Hospital

8:00 - Urology Staff Conference; T. H. Sweetser; Main Classroom.

9:00 - Psychiatry Grand Rounds; R. W. Anderson; Station 3.

9:30 - Pediatrics Rounds on all Stations; R. B. Raile.

11:00 - 12:00 Medical X-ray Conference; O. Lipschultz, Thomas Lowry and Staff; Main Classroom.

Veterans Administration Hospital

8:00 - Proctology Rounds; W. C. Bernstein and Staff; Bldg. III.

8:30 - Medical X-ray Conference; Conference Room, Bldg. I.