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and
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Differential Diagnosis of Jaundice

Volume XX | Friday, November 12, 1948 | Number 7

BULLETIN OF THE
UNIVERSITY OF MINNESOTA HOSPITALS
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INDEX

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UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
CALENDAR OF EVENTS

Visitors Welcome

November 15 - 20, 1948

No. 222

Monday, November 15

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; M-109, U. H.

8:00 - Fracture Rounds; A. A. Zierold and Staff; Ward A, Minneapolis General Hospital.

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

11:00 - 11:50 Roentgenology-Medicine Conference; Staff, Veterans' Hospital.

11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Eustis Amphitheater, U. H.

11:00 - 11:50 Physical Medicine Seminar; E-101, U. H.

12:00 - 1:00 Physiology Seminar; M. B. Visscher; 214 M. H.

12:15 - 1:20 Obstetrics and Gynecology Journal Club; Staff Dining Room, U. H.

12:30 - 1:20 Pathology Seminar; 104 I. A.

12:30 - 1:50 Surgery Grand Rounds; A. A. Zierold, Clarence Dennis and Staff; Minneapolis General Hospital.

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

2:00 - 3:00 Surgery Problem Case Conference; C. Dennis and Staff; Small Class Room, General Hospital.

3:45 - Pediatric Seminar; Jaundice; T. Smith; 6th Floor, Child Psychiatry, U. H.

4:00 - 6:00 School of Public Health Seminar; 113 MeS.

5:00 - 6:00 Urology-Roentgenology Conference; D. Creevy and H. M. Stauffer and Staffs; M-109, U. H.

5:00 - 5:50 Clinical Medical Pathologic Conference; Todd Amphitheater, U. H.

Tuesday, November 16

8:30 - 10:20 Surgery Seminar; Lyle Hay; Small Conference Room, Bldg. I, Veterans' Hospital.

9:00 - 9:50 Roentgenology Pediatrics Conference; L. G. Rigler, I. McQuarrie and Staff; Todd Amphitheater, U. H.

10:30 - 11:50 Surgical Pathological Conference; Lyle Hay and Robert Hebbel; Veterans' Hospital.

12:30 - 1:20 Pathology Conference; Autopsies; Pathology Staff; 102 I. A.

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

3:15 - 4:20 Gynecology Chart Conference; J. L. McKelvey and Staff; Station 54, U. H.

3:30 - 4:20 Clinical Pathological Conference; Staff; Veterans' Hospital.

4:00 - 5:00 Pediatric Rounds on Wards; I. McQuarrie and Staff; U. H.

5:00 - 5:50 Urology Pathological Conference; C. D. Creevy and Staff; Todd Amphitheater, U. H.

5:00 - 6:00 X-ray Conference; Dr. Aurelius and Staff; Powell Hall Amphitheater.

Wednesday, November 17

88:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-515, U. H.

8:30 - 10:00 Orthopedic-Roentgenologic Conference; Edward T. Evans; Room 1AW, Veterans' Hospital.

8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker and Joe R. Brown; Veterans' Hospital.

11:00 - 12:00 Pathology-Medicine-Surgery Conference; O. H. Wangensteen, C. J. Watson and Staff; Todd Amphitheater, U. H.

12:00 - 12:50 Radio Isotope Seminar; Emission and Absorption of Alpha Rays; J. C. Wang; Rm. 216, Hospital Court, Temporary Bldg.

1:00 - 3:00 Kellogg Lecture; Physiology of the Pituitary Gland; Leo T. Samuels; Todd Amphitheater.

4:00 - 5:00 Infectious Disease Rounds; Main Lecture Room; Minneapolis General Hospital.

4:00 - 5:30 Surgery-Physiology Conference; O. H. Wangensteen and M. B. Visscher; Todd Amphitheater, U. H.

Thursday, November 18

8:15 - 9:00 Roentgenology-Surgical-Pathology Conference; Craig Freemandand H. M. Stauffer; M-109, U. H.

8:30 - 10:20 Surgery Grand Rounds; Lyle Hay and Staff; Veterans' Hospital.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; M-109, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:50 Surgery-Radiology Conference; Daniel Fink and Lyle Hay; Veterans' Hospital.

11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Todd Amphitheater, U. H.

11:30 - 12:30 Clinical Pathology Conference; Steven Barron, C. Dennis, George Fahr, A. V. Stoesser and Staffs; Large Class Room, Minneapolis General Hospital.

12:00 - 1:00 Physiological Chemistry Seminar; Methionine Formation by Transmethylation in Vitro; William Cohen; 214 M. H.

1:00 - 1:50 Fracture Conference; A. A. Zierold and Staff; Minneapolis General Hospital.

4:00 - 5:00 Bacteriology and Immunology Seminar; Heat Resistance of Coliform Bacteria in Milk; J. Olson; 214 M. H.

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

5:00 - 6:00 X-ray Seminar; Thoracic Surgery Conference; Richard Varco and N. K. Jensen; Todd Amphitheater.

Friday, November 19

8:30 - 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.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:20 Medicine Grand Rounds; Staff; Veterans' Hospital.

10:30 - 11:50 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Department, U. H.

11:00 - 12:00 Surgery-Pediatric Conference; C. Dennis, A. V. Stoesser and Staffs; Minneapolis General Hospital.

11:30 - 12:50 University of Minnesota Hospitals General Staff Meeting; Epithelial Tumors of the Intestine; Walter A. Fansler and Howard M. Frykman; Powell Hall Amphitheater.

12:00 - 1:00 Surgery Clinical Pathological Conference; Clarence Dennis and Staff; Minneapolis General Hospital; Small Classroom.

1:00 - 1:50 Dermatology and Syphilology; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312, U. H.

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

2:00 - 3:00 Kellogg Lecture; Radiation Therapy of Tumors of the Genital Tract; K. W. Stenstrom; Eustis Amphitheater.

Saturday, November 20

7:45 - 8:50 Orthopedics Conference; Wallace H. Cole and Staff; Station 21, U. H.

8:00 - 9:00 Pediatric Psychiatric Rounds; Reynold Jensen; 6th Floor, West Wing, U. H.

8:00 - 9:00 Surgery Literature Conference; Clarence Dennis and Staff; Minneapolis General Hospital, Small Classroom.

9:00 - 12:00 Surgery-Roentgenology Conference; O. H. Wangensteen, L. G. Rigler, H. M. Stauffer, and Staff; Todd Amphitheater, U. H.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; E-101, U. H.

9:00 - 10:30 Pediatric Grand Rounds; I. McQuarrie and Staff; Eustis Amphitheater, U. H.

9:00 - 12:00 Psychiatry Conference; Powell Hall Amphitheater.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

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

11:00 - 11:50 Urology Seminar; Perirenal Air Insufflation; Brian McGroarty; E-101, U. H.

11:00 - 12:00 Anatomy Seminar; Effects of Estrogen upon the Embryonic Development of the Reproductive Organs; Rachel L. Fralick; Hypersensitivity in Disease; Harold Brody; 226 I. A.

II. EVALUATION OF LABORATORY TESTS IN THE DIFFERENTIAL DIAGNOSIS OF JAUNDICE

F. W. Hoffbauer
E. D. Rames
J. K. Meinert

The employment of multiple biochemical tests to analyze liver function has received general clinical acceptance. This practice has been in vogue for some time at the University of Minnesota Hospitals. In recent years, concerted efforts have been made to standardize some of these procedures. The aim has been two-fold: (1) to evaluate the merits of single tests, and (2) to evaluate the merits of various combinations of tests.

The employment of composite tests for the evaluation of liver function in the non-jaundiced patient has been of considerable aid. Liver function schedule number 1 included the following procedures:

1. Urine bilirubin
2. Quantitative serum bilirubin
3. Cephalin-cholesterol flocculation
4. Thymol turbidity
5. Bromsulphalein test
6. Quantitative urine Ehrlich reaction
7. Quantitative urine urobilinogen
8. Quantitative urine coproporphyrin

This group of tests is quite informative and all of the procedures, save for the urinary coproporphyrin analysis, are available by most hospital laboratories in this area. Experience to date has indicated that this composite analysis represents the minimum number of procedures one must perform if a thorough clinical biochemical investigation of liver function is desired. This does not imply that this arrangement of tests is necessarily ideal. An occasional individual with extensive cirrhosis has exhibited entirely normal results in all of these tests. The limitations of all so-called liver function tests must be admitted.

As an aid in the differential diagnosis and as a means of following the progress of jaundiced patients, two additional composite studies have been employed. Liver function schedule number 2 included:

1. Quantitative serum bilirubin
2. Quantitative fecal Ehrlich reaction
3. Quantitative urine Ehrlich reaction
4. Cephalin-cholesterol flocculation test
5. Thymol turbidity test
6. Total serum cholesterol determination
7. Esterified serum cholesterol determination
8. Alkaline phosphatase activity determination

For further analysis of liver function in the jaundiced patient, liver schedule number 3 has been utilized. This included:

1. Serum albumin
2. Serum globulin
3. Hippuric acid synthesis (Quick's test)
4. Prothrombin time
5. Prothrombin response to vitamin K

The present analysis has been undertaken mainly with the purpose of evaluating those tests included in schedule number 2, which may be performed on a single sample of blood obtained in the fasting state. The value of determination of the stool and urine urobilinogen in differential diagnosis have been described in previous reports[1,2,3,4].

The classification of jaundice employed by Rich[5] has been followed in this clinic. Cases included under the designation of retention jaundice are usually distinctive. The quantitative van den Bergh reaction has great value in detecting the retention type of jaundice. The quantitative serum bilirubin as determined by Ducci and Watson's modification[6] of the method of Malloy and Evelyn[7] has been employed routinely. Experience with this test has been described elsewhere[8]. The group of cases included in the category of regurgitation jaundice present the real problem in differential diagnosis. Parenchymal

liver disease and extrahepatic biliary obstruction both give rise to regurgitation jaundice. The differentiation between what may be termed medical and surgical types of jaundice is at times very difficult. The clinician often requires assistance in the form of biochemical data in order to determine the cause of the patient's illness. For this reason, the present analysis has been restricted to instances of regurgitation jaundice.

Cases chosen for the present study include 147 patients studied at the University of Minnesota Hospitals during the period January 1, 1945 to July 1, 1948. The following criteriae were employed in selection:

1. Serum bilirubin
   1' value greater than 0.4 mg./100cc. and total value greater than 2.0 mg./100 cc.

2. Simultaneous determination of serum bilirubin, cholesterol, alkaline phosphatase, cephalin-cholesterol and thymol turbidity on a single sample of blood.

3. Diagnosis proven by biopsy, operation or necropsy; exception was made in the cases of viral hepatitis where a clinical diagnosis was accepted if it seemed established beyond reasonable doubt.

Employing such criteriae for selection, 77 cases of regurgitation jaundice due to extrahepatic biliary obstruction were chosen. This group includes:

1. 28 cases of cancerous obstruction
2. 39 cases of common duct stone
3. 10 cases of bile duct stricture

In each instance the diagnosis was verified by operation or by necropsy.

The results obtained in the above group of cases have been contrasted with those obtained in 70 instances of parenchymal liver disease where jaundice of the regurgitation type was present.

This group included:

1. 26 cases of cirrhosis
2. 31 cases of hepatitis
3. 13 cases of parenchymal liver disease due to miscellaneous causes.

The methods employed for the determination of these tests, together with normal values are listed in table I. The anticipated results in extrahepatic biliary obstruction and in parenchymal liver disease are contrasted in table II.

The actual results obtained in the cases studied are listed in tables III, IV, V, VI, VII, and VIII. Values of the thymol turbidity, cephalin-cholesterol flocculation (24 hours reading), total serum cholesterol, cholesterol ester percentage and the alkaline phosphatase which failed to conform with the anticipated results (according to table II) are underlined.

The instances in which the actual results failed to conform with the anticipated results are tabulated in table IX. At first glance it may appear that there is so much variation that little or no reliance may be placed on such biochemical data for the purpose of differential diagnosis. Actually this is not the case, as will be brought out in the following.

An analysis of the behavior of the serum bilirubin indicates that, in this series of cases, the ratio of the prompt reacting bilirubin (one minute reading) to the total bilirubin did not have diagnostic significance. Thus the limitation of quantitative van den Bergh reaction in differentiating various types of regurgitation jaundice must be kept in mind.

The elevation of the total serum cholesterol which accompanies extrahepatic obstructive jaundice is well known. The majority of this type of case in the present series exhibited cholesterol levels above 225 mg. per 100 cc. Conversely, most instances of diffuse parenchymal liver damage had levels below this figure. The cholesterol ester frac-

tion was frequently noted to be below 50 per cent in extrahepatic obstruction even though the total value was elevated. This was particularly striking in those instances where carcinoma was the cause of the bile duct obstruction.

The alkaline phosphatase activity of the serum is commonly increased in jaundice due to extrahepatic bile duct obstruction. In general, the results observed in the present study corresponded with the anticipated values.

The two determinations designed to detect qualitative changes in the serum proteins, i.e., the cephalin-cholesterol flocculation test and the thymol turbidity test, proved to be extremely helpful. The thymol turbidity and the cephalin-cholesterol test were both positive in but one instance in the group of 77 cases of extrahepatic obstruction, although both were frequently negative in a number of instances of parenchymal liver disease.

An analysis of this data confirms the well established fact that patients with regurgitation jaundice due to extrahepatic biliary obstruction exhibit rather characteristic biochemical responses. These can be detected by such commonly employed procedures as the serum cholesterol and alkaline phosphatase activity. The combined use of thymol turbidity reaction of Maclagan and the cephalin-cholesterol flocculation test of Hanger is recommended in the study of the jaundiced patient. It is very unusual for both tests to yield positive results when the cause of the jaundice is obstruction by carcinoma, stone or stricture. It must be recognized, however, that many cases of parenchymal liver disease with definite jaundice do not exhibit positive flocculation or turbidity reactions. Such cases may closely mimic extrahepatic obstructive jaundice, both clinically and biochemically.

The differential diagnosis of jaundice is a problem that can only be solved by careful study and sound clinical judgment. Laboratory tests are merely auxiliary aids to the clinician. Certain characteristic patterns of biochemical response do occur as the result of hepatic disease and bile duct obstruction. The recognition of these is often of distinct aid in the problem of determining the cause of jaundice. Most cases of extrahepatic bile duct obstruction due to carcinoma, stone or stricture exhibit hyperbilirubinemia, elevated cholesterol and alkaline phosphatase levels and qualitatively normal serum proteins as judged by the thymol turbidity and the cephalin-cholesterol flocculation tests.

Many cases of jaundice due to diffuse liver disease exhibit biochemical changes of an opposite nature. A fair number, possibly one-fifth, of the instances of parenchymal liver disease exhibit changes that closely parallel those seen in extrahepatic obstruction, i.e., elevated cholesterol and phosphatase values and negative tests for abnormal proteins. This constitutes a limitation to the use of so-called tests of liver function in differential diagnosis that must be accepted. It is a reflection of a basic pathologic phenomenon: diffuse liver damage secondary to a variety of causes may manifest itself with varying emphasis on hepatocellular or cholangiolar functional impairment. The former is the classical type and yields biochemical changes that are quite characteristic. The latter is characterized by biochemical changes entirely similar to those seen in extrahepatic biliary obstruction.

Table I

BIOCHEMICAL PROCEDURES EMPLOYED

PROCEDURE	METHOD	NORMAL VALUE
1. Serum Bilirubin	Ducci and Watson (6)	1' (prompt direct) 0.2 mg. / 100 cc. T (total, direct plus indirect) 1.0 mg. / 100 cc.
2. Cephalin-Cholesterol Flocculation	Hanger (9)	A reading greater than 1+ at 24 hours may be considered abnormal
3. Thymol Turbidity	MacLagan (10)	0 to 4 units
4. Serum Cholesterol (total)	Schoenheimer and Sperry (11)	180 to 220 mg. per 100 cc.
5. Serum Cholesterol (esterified fraction)	Schoenheimer and Sperry (11)	50 - 65% of total
6. Alkaline Phosphatase	Bodansky (12)	1 - 4 units per 100 cc.

Table II

ANTICIPATED RESULTS IN BIOCHEMICAL TESTS EMPLOYED IN PRESENT STUDY

Type of Liver Disease	Cephalin-Cholesterol (24 hour reading	Thymol Turbidity (MacLagan)	Total Serum Cholesterol	Cholesterol Ester Percent Age	Alkaline Phosphatase (Bodansky)
Extrahepatic Obstruction	1+ or below	0 to 4 units	Above 225 mg. per 100 cc.	Above 50%	Above 10 units
Parenchymal Liver Disease	Above 1+	Above 4 units	Below 225 mg. per 100 cc.	Below 50%	Below 10 units

Table III

RESULTS IN CASES OF EXTRAHEPATIC OBSTRUCTION DUE TO CARCINOMA

Case	Sex	Age	Duration of Jaundice	Serum Bilirubin 1'	Serum Bilirubin Total	Serum Bilirubin 1'/T%	Cholesterol Total	Cholesterol Ester	Cholesterol Ester%	Cephalin Cholesterol 24 hr.	Cephalin Cholesterol 48 hr.	Thymol Turbidity	Alkaline Phosphatase	Diagnosis Established By
1	M	77	2 days	1.0	2.2	45	174	92	53	0	0	2	32	Operation
2	F	83	6 days	4.2	7.4	57	288	46	16	3+	4+	6	25	Necropsy
3	F	81	7 days	17.5	30.7	57	360	50	14	Tr	1+	2	50	Necropsy
4	M	71	10 days	9.9	17.0	58	354	103	29	0	0	2	18	Operation
5	M	56	12 days	9.2	15.2	61	198	115	58	2+	3+	1	31	Necropsy
6	M	60	14 days	3.8	6.2	61	358	218	61	0	1+	3	6	Operation
7	M	40	14 days	9.9	18.1	55	234	133	57	1+	1+	3	6	Operation
8	M	66	3 weeks	13.7	24.0	57	350	126	36	0	0	3	22	Operation
9	M	70	4 weeks	8.0	12.1	66	114	30	26	1+	1+	3	12	Necropsy
10	F	71	4 weeks	15.6	27.9	55	676	277	41	0	Tr	3	69	Necropsy
11	F	60	4 weeks	14.5	25.4	57	594	184	31	0	Tr	2	24	Operation
12	F	62	4 weeks	8.6	18.2	47	570	274	48	0	0	9	22	Operation
13	F	75	5 weeks	9.0	14.5	62	238	74	31	0	1+	2	13	Necropsy
14	M	63	6 weeks	9.9	17.5	57	236	125	53	0	1+	2	3	Operation
15	M	68	6 weeks	18.7	63.5	29	310	46	15	1+	1+	2	19	Operation
16	M	59	6 weeks	24.0	41.6	58	506	40	8	0	0	1	31	Necropsy
17	M	56	6 weeks	9.4	20.7	45	236	47	20	1+	1+	5	31	Necropsy
18	M	61	6 weeks	3.3	7.1	46	268	185	69	0	Tr	2	12	Operation
19	M	74	7 weeks	17.0	31.7	57	290	107	37	0	0	1	30	Operation
20	M	65	7 weeks	16.8	31.0	54	640	214	33	0	0	2	18	Necropsy
21	F	67	7 weeks	12.8	22.6	57	510	56	11	0	0	1	32	Operation
22	M	72	8 weeks	1.9	3.6	53	208	125	60	1+	1+	2	35	Operation
23	F	62	8 weeks	15.3	26.0	59	360	83	23	1+	1+	3	13	Operation
24	F	60	4 months	14.8	28.3	52	296	15	5	1+	1+	2	20	Necropsy
25	M	76	4 months	15.8	28.8	55	130	32	25	Tr	1+	3	15	Necropsy
26	F	72	6 months	17.7	31.8	56	720	346	48	1+	1+	5	44	Necropsy
27	F	56	11 months	8.7	14.5	60	362	98	27	0	0	3	27	Operation
28	M	38	?	10.2	17.1	60	370	100	27	0	0	4	9	Operation

Table IV

RESULTS IN CASES OF EXTRAHEPATIC OBSTRUCTION DUE TO COMMON DUCT STONE

Case	Sex	Age	Duration of Jaundice	Serum Bilirubin			Cholesterol			Cephalin Cholesterol		Thymol Turbidity	Alkaline Phosphatase	Diagnosis Established By
				1'	Total	1'/T%	Total	Ester	Ester%	24 hr.	48 hr.			
29	F	77	2 days	1.0	2.4	42	240	154	64	0	0	2	9	Operation
30	F	68	2 days	4.7	8.2	57	100	29	29	1+	1+	2	6	Necropsy
31	F	73	2 days	1.0	2.1	48	328	216	66	1+	1+	2	25	Operation
32	F	73	3 days	2.5	4.9	51	164	82	50	0	Tr	2	5	Operation
33	F	62	3 days	1.6	3.2	50	194	116	60	0	1+	2	24	Operation
34	M	67	4 days	7.0	11.4	61	124	41	33	1+	2+	1	3	Operation
35	F	41	4 days	2.1	3.9	54	272	169	62	0	0	2	35	Operation
36	M	81	5 days	1.8	3.3	55	234	140	60	0	0	2	18	Necropsy
37	F	67	5 days	1.3	2.8	46	250	175	70	0	0	2	26	Operation
38	F	36	7 days	8.0	14.1	57	240	84	35	3+	4+	2	14	Operation
39	M	64	7 days	1.2	2.2	54	152	107	71	0	0	1	15	Operation
40	M	73	8 days	2.9	4.8	60	126	79	63	1+	2+	1	5	Operation
41	M	74	14 days	8.4	12.9	65	328	167	51	0	0	2	3	Operation
42	F	31	14 days	7.8	11.8	66	338	98	29	0	0	2	15	Operation
43	F	37	3 weeks	0.9	2.6	35	160	107	67	0	0	2	6	Operation
44	F	54	3 weeks	5.4	9.7	56	230	62	27	0	Tr	1	12	Operation
45	M	57	3 weeks	6.0	8.6	63	192	117	61	1+	1+	2	34	Operation
46	M	58	4 weeks	1.7	3.8	45	234	150	64	0	0	1	19	Operation
47	F	52	6 weeks	5.8	12.0	48	234	122	52	0	0	3	6	Operation
48	F	37	6 weeks	3.9	6.8	57	276	124	45	0	1+	4	15	Operation
49	M	51	6 weeks	2.3	3.9	59	260	156	60	0	0	1	15	Operation
50	M	74	8 weeks	2.3	3.9	59	260	187	72	0	0	1	60	Operation
51	F	72	10 weeks	1.1	2.1	52	262	141	54	0	Tr	2	14	Operation
52	F	56	10 weeks	4.6	8.7	53	668	100	15	0	0	5	55	Operation
53	M	73	12 weeks	1.4	3.0	47	112	73	65	0	1+	1	14	Operation
54	M	58	12 weeks	3.1	6.5	48	346	197	57	0	1+	1	11	Operation
55	M	76	12 weeks	1.6	3.4	47	252	108	43	0	0	1	14	Operation
56	F	44	4 months	1.5	3.2	47	244	159	65	0	0	1	18	Operation
57	F	47	6 months	5.3	11.2	47	394	193	49	0	0	3	33	Operation
58	F	52	6 months	1.0	2.0	50	210	147	70	0	0	1	14	Operation
59	M	77	6 months	5.1	9.9	52	138	55	40	2+	3+	3	9	Operation
60	F	45	9 months	4.4	7.0	63	336	185	55	0	0	2	19	Operation
61	F	72	1 year	1.1	2.2	50	226	131	58	0	0	3	27	Operation
62	F	53	2 years	1.0	2.2	45	294	218	74	0	0	3	18	Operation
63	M	74	2½ years	1.0	2.8	36	312	218	70	0	0	2	27	Operation
64	F	63	?	1.5	2.7	56	300	200	66	0	0	1	27	Operation
65	M	72	?	7.3	11.6	63	300	132	44	0	0	1	6	Operation
66	M	71	?	.8	2.4	33	122	78	64	0	0	1	9	Operation
67	F	55	?	3.0	5.0	60	232	155	67	1+	1+	1	8	Operation

Table V

RESULTS IN CASES OF EXTRAHEPATIC OBSTRUCTION DUE TO COMMON DUCT STRICTURE

Case	Sex	Age	Duration of Jaundice	Serum Bilirubin			Cholesterol			Cephalin Cholesterol		Thymol Turbidity	Alkaline Phosphatase	Diagnosis Established By
				1'	Total	1'/T%	Total	Ester	Ester%	24 hr.	48 hr.			
68	F	56	3 days	3.4	5.4	63	140	94	67	0	1+	3	34	Operation
69	M	66	7 weeks	15.1	27.7	55	212	49	23	0	0	2	12	Operation
70	F	34	8 weeks	3.5	6.8	51	362	188	52	0	0	2	37	Operation
71	M	36	12 weeks	0.5	2.1	24	212	146	69	0	1+	1	20	Operation
72	M	31	12 weeks	15.2	24.6	62	868	434	51	0	0	1	20	Operation
73	F	30	4 months	2.1	4.1	51	294	150	51	0	0	3	23	Operation
74	F	67	1 year	6.3	10.5	60	258	72	28	0	0	3	24	Operation
75	F	42	1 year	5.5	10.2	54	920	488	53	1+	1+	6	50	Operation
76	F	49	7 years	2.4	4.4	55	228	146	64	0	0	1	4	Operation
77	F	55	8 years	4.2	6.9	61	380	213	56	0	0	1	20	Operation

Table VI

RESULTS IN CASES OF PARENCHYMAL LIVER DISEASE DUE TO CIRRHOSIS

Case	Sex	Age	Duration of Jaundice	Serum Bilirubin			Cholesterol			Cephalin Cholesterol		Thymol Turbidity	Alkaline Phosphatase	Diagnosis Established By
				1'	Total	1'/T%	Total	Ester	Ester%	24 hr.	48 hr.			
78	F	62	2 weeks	13.8	21.8	63	276	19	7	3+	4+	18	13	Biopsy
79	M	63	4 weeks	6.4	10.0	64	124	53	43	0	0	3	3	Necropsy
80	M	30	4 weeks	1.3	4.0	32	156	31	20	2+	3+	4	3	Necropsy
81	M	70	6 weeks	1.6	2.4	67	146	76	52	2+	3+	7	3	Biopsy
82	M	42	10 weeks	0.8	2.4	33	204	126	62	1+	2+	4	2	Biopsy
83	M	59	12 weeks	2.1	3.9	54	170	76	45	3+	4+	24*	5	Necropsy
84	M	33	12 weeks	13.1	27.6	47	96	22	23	3+	4+	14	17	Biopsy
85	F	35	4 months	2.4	5.1	47	384	230	60	2+	2+	9	26	Biopsy
86	F	62	5 months	3.2	5.5	58	244	146	60	Tr.	Tr.	9*	9	Operation
87	M	54	6 months	3.8	15.9	24	248	114	46	3+	4+	10	14	Necropsy
88	F	12	9 months	4.2	7.7	55	126	68	54	3+	4+	21	11	Biopsy
89	M	32	11 months	3.4	7.0	49	112	60	54	3+	3+	19	9	Operation
90	M	30	1 year	13.9	26.5	53	126	32	25	3+	4+	3	13	Necropsy
91	M	58	1 year	1.2	2.7	44	138	88	64	2+	3+	2	3	Biopsy
92	F	44	2 years	2.1	6.4	33	314	176	56	1+	2+	9	6	Biopsy
93	F	42	3 years	7.0	11.4	61	430	181	42	1+	2+	9	39	Necropsy
94	F	51	3 years	1.2	2.4	50	504	328	65	2+	3+	7	18	Biopsy
95	F	47	3 years	1.5	2.8	54	176	113	64	1+	2+	4	18	Biopsy
96	F	20	3 years	4.1	7.9	52	178	105	59	3+	4+	16	13	Clinical
97	M	61	6 years	1.5	3.5	43	248	154	62	0	1+	6	12	Biopsy
98	F	37	7 years	1.7	2.7	63	420	214	51	0	0	3	63	Operation
99	F	54	10 years	0.8	2.0	40	156	89	57	1+	2+	1	28	Biopsy
100	M	8	?	1.0	3.2	31	108	55	51	3+	4+	21	4	Operation
101	F	8	?	2.6	5.6	46	136	49	36	3+	4+	10	6	Peritoneoscopy
102	F	10	?	1.3	2.0	45	92	30	33	3+	4+	9	9	Biopsy
103	F	23	?	4.8	8.0	60	196	114	58	2+	2+	3	19	Necropsy

*Ducci Method

Table VII

RESULTS IN CASES OF PARENCHYMAL LIVER DISEASE DUE TO HEPATITIS

Case	Sex	Age	Duration of Jaundice	Serum Bilirubin			Cholesterol			Cephalin Cholesterol		Thymol Turbidity	Alkaline Phosphatase	Diagnosis Established By
				1'	Total	1'/T%	Total	Ester	Ester%	24 hr.	48 hr.			
104	M	74	1 day	12.9	21.7	59	140	27	19	3+	3+	2	11	Biopsy
105	M	20	2 days	5.2	8.4	62	218	61	28	3+	4+	15	4	Clinical
106	F	26	3 days	6.1	10.7	59	206	82	40	2+	3+	3	4	Clinical
107	F	29	3 days	1.3	2.4	54	184	103	56	3+	4+	12	8	Clinical
108	M	56	3 days	2.9	5.6	52	230	135	58	0	0	1	8	Clinical
109	M	50	3 days	4.6	7.7	60	170	85	50	3+	4+	9*	3	Clinical
110	M	12	4 days	5.7	9.2	62	153	23	15	2+	3+	21	9	Clinical
111	M	59	4 days	25	39	64	176	42	24	3+	4+	16	8	Clinical
112	M	26	4 days	3.8	7.5	51	242	145	60	2+	3+	8	10	Clinical
113	F	19	6 days	3.1	6.6	47	210	65	31	3+	4+	8	4	Clinical
114	M	33	7 days	7.8	13.0	60	166	61	37	3+	4+	14	8	Clinical
115	M	64	7 days	15.0	27.7	54	226	34	15	3+	4+	5	7	Clinical
116	M	4	8 days	4.3	7.3	59	244	44	18	2+	3+	18	13	Clinical
117	M	20	8 days	1.7	4.6	59	132	61	46	2+	3+	6	5	Clinical
118	F	20	9 days	2.8	5.4	52	196	59	30	1+	2+	12	6	Clinical
119	F	32	10 days	1.8	3.0	60	252	88	35	3+	4+	18	8	Clinical
120	F	19	10 days	1.9	3.5	54	286	109	38	3+	3+	30	8	Clinical
121	F	20	11 days	3.2	7.0	46	186	93	49	3+	4+	9	7	Clinical
122	M	31	14 days	11.7	19.0	62	154	31	20	3+	4+	6	4	Clinical
123	F	34	3 weeks	2.6	5.7	46	280	126	45	2+	2+	16	5	Clinical
124	M	64	3 weeks	3.0	5.2	78	490	314	64	3+	4+	21	15	Biopsy
125	F	12	3 weeks	3.1	5.1	61	156	75	48	2+	3+	12	13	Clinical
126	F	49	3 weeks	4.2	7.5	56	214	66	31	3+	4+	33	12	Clinical
127	F	46	3 weeks	14.0	26.9	52	81	12	15	2+	3+	6	8	Necropsy
128	F	13	8 weeks	2.6	4.8	54	100	30	30	2+	3+	5	30	Biopsy
129	M	41	8 weeks	5.9	10.1	58	212	117	55	0	0	1	16	Clinical
130	F	31	12 weeks	7.7	15.2	51	118	61	52	3+	4+	4	3	Necropsy
131	M	32	4 months	3.9	8.3	47	244	151	62	1+	1+	15	5	Biopsy
132	F	55	4 months	9.2	16.1	57	262	24	9	3+	4+	27	9	Necropsy
133	F	18	6 months	3.7	7.7	48	158	90	57	3+	4+	10	4	Clinical
134	M	58	9 months	.9	2.1	43	260	169	65	1+	2+	12	8	Biopsy

*Ducci Method

Table VIII

RESULTS IN CASES OF PARENCHYMAL LIVER DISEASE DUE TO MISCELLANEOUS CAUSES

Case	Sex	Age	Duration of Jaundice	Serum Bilirubin		Cholesterol				Cephalin Cholesterol		Thymol Turbidity	Alkaline Phosphatase	Diagnosis Established By
				1'	Total	1'/T%	Total	Ester	Ester%	24 hr.	48 hr.			
						CARDIAC JAUNDICE								
135	F	39	4 weeks	0.8	2.4	33	100	70	70	2+	3+	6	3	Necropsy
136	M	57	4 weeks	7.0	12.6	56	64	20	31	2+	3+	3	2	Necropsy
137	M	71	8 weeks	1.1	3.5	31	170	114	67	1+	2+	1	4	Clinical
138	M	45	9 months	1.0	2.4	42	116	73	63	1+	1+	8	5	Clinical
139	M	52	?	1.7	2.7	63	206	144	70	2+	3+	3	3	Clinical
						LYMPHOBLASTOMA								
140	F	15	2 weeks	2.9	5.6	51	90	8	9	1+	2+	2	6	Necropsy
141	M	47	7 weeks	0.7	2.9	24	370	74	20	0	Tr.	2	102	Biopsy
						SEPTICEMIA								
142	M	1	7 weeks	3.3	7.4	45	126	59	47	Tr.	1+	2	18	Blood Culture
143	M	70	?	4.3	6.6	65	90	42	47	1+	2+	1	12	Blood Culture
						SULFA REACTION								
144	M	13	6 days	7.5	13.1	57	200	44	22	1+	1+	6	15	Necropsy
						AMYLOIDOSIS								
145	M	68	?	0.8	2.4	33	226	131	58	0	0	16	4	Necropsy
						PERNICIOUS ANEMIA								
146	M	73	6 months	0.6	2.5	24	152	96	63	0	0	1	1	Hematology
						FATTY METAMORPHOSIS								
147	F	26	?	4.8	8.7	55	34	4	12	1+	2+	1	7	Necropsy

Table IX

NUMBER OF INSTANCES IN WHICH ACTUAL RESULTS FAILED TO CONFORM WITH ANTICIPATED RESULTS

Type of Disease	Number of Cases	Cephalin-Cholesterol	Thymol Turbidity	Serum Cholesterol	Cholesterol Ester Percentage	Alkaline Phosphatase
Carcinoma	28	2	4	5	21	3
Common Duct Stone	39	2	1	12	11	12
Common Duct Stricture	10	0	1	3	2	1
Total	77	4	6	20	34	16
Cirrhosis	26	9	9	9	16	14
Hepatitis	31	5	6	11	10	8
Miscellaneous Hepatic Disease	13	10	9	2	6	4
Total	70	24	24	22	32	26

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III. MEDICAL SCHOOL NEWS

Clinical Research Club

The opening meeting on November 8 of the Clinical Research Club demonstrated again the ability of younger members of our staff to present stimulating and informative reports on their research. Dr. Ellard M. Yow of the Department of Medicine spoke on "Laboratory and Clinical Experience with Aureomycin." Dr. George Moore of the Department of Surgery reported on "Localization of Brain Tumors with Radioactive Di-iodofluorosine."

The Clinical Research Club meets in Eustis Amphitheater the evening of the second Monday of each month. All interested visitors are welcome. Interns, fellows, and instructors are especially invited to become members of this worthwhile organization. Those interested in becoming members or in presenting papers before this group should communicate with Dr. Howard L. Horns, President.

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Continuation Course in Gynecology

A continuation course in gynecology will be presented at the Center for Continuation Study on November 15 and 16. The first day of the course will be devoted to the problem of birth trauma. Gynecologic endocrinology will be the subject of the second day's program. Distinguished visiting guests who will participate in the course as members of the faculty include Dr. Virgil S. Counseller, Mayo Clinic; Dr. Willard Allen, Washington University, St. Louis, Missouri; and Dr. Leo T. Samuels, Department of Biochemistry of the University of Utah, Salt Lake City. Clinical and full-time staff members of our own Department of Obstetrics and Gynecology will complete the roster of faculty members for the course.

Dr. Merendino Leaves University

Dr. K. Alvin Merendino of the Department of Surgery has accepted an appointment as Associate Professor of Surgery at the University of Washington in Seattle. Dr. Merendino has earned the respect and gratitude of numerous students during his period of service here at the University. He has done an outstanding job of teaching in that portion of the veteran physicians' course in the Basic Sciences which has been conducted under his direction at Ancker Hospital in St. Paul. Although his many friends here are sorry to see him leave our campus, they are happy that he has gained this recognition and greater opportunity for teaching and research.

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Dr. Ambrose J. Hertzog, formerly Assistant Professor of Pathology, has assumed his new position as Pathologist in Chief to the Touro Infirmary of New Orleans. Dr. Hertzog is a native of Louisiana and received his M.D. degree at Tulane University and his PhD. degree in Pathology at the University of Minnesota.

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Kathryn F. Stein, PhD., Professor of Zoology at Mount Holyoke College, is an Honorary Fellow in the Department of Anatomy. Dr. Stein is doing research in hematology with Dr. Arthur Kirschbaum.

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Dr. Richard Miller, formerly Assistant Professor of Anatomy here at the University, is now Assistant Professor of Anatomy in the Albany Medical College of Union University, Albany, New York.

Medical Foundation Describes Gifts

Alumni and friends of the Minnesota Medical School will be interested in learning more of the facts about gifts and bequests which have been made to its Minnesota Medical Foundation.

In its brief career of eight years and in spite of interrupted interests during the war years, the Foundation has thus far received $91,660.32, disbursed $33,705.50, and has assets at present of $37,016.90. More than 100 new annual members ($10.00 per year) and two life members ($100.00) have enrolled since the recent increase in the organization's activities. Membership now provides an automatic subscription to the weekly "Bulletin of the University of Minnesota Hospitals and Minnesota Medical Foundation."

Officers of the Foundation are now cooperating with committees from the state and national obstetrical societies hoping to establish a graduate fellowship in honor of the late Dr. J. C. Litzenberg.

Dr. Lawrence Randall, Mayo Clinic, who is Chairman of the Obstetrical Society Committee, has stated that the Dr. Litzenberg Memorial should be great enough to be shared by more than local groups. If these plans materialize, it will represent the second voluntary fellowship established in the Medical School.

Alumni Notes

Dr. Mancel T. Mitchell, ('35MD) announces his association with Dr. Owen F. Robbins ('33MD) and John T. Moohn, M.D. at 735 Medical Arts Building and 2300 West 50th Street, Minneapolis.

Dr. Alfred F. Hoff ('10MD) former associate professor of Clinical Medicine at the University, died recently in Minneapolis. He was 65 years of age. Following his internship at Ancker Hospital, Dr. Hoff studied in Vienna before establishing his practice in St. Paul. He was a member of the board of trustees of St. Luke's Hospital, St. Paul, and a member of the Ramsey County Medical Society, American College of Physicians, Minnesota Academy of Medicine, and St. Paul Society of Internal Medicine.

Frank E. Griswold ('97MD), Hoffman, Minnesota, died in November. He was 74 years of age. Dr. Griswold was honored in Hoffman last month at a community celebration for his 50 years in the medical profession. He had retired two months ago from active practice.

Robert M. Drake ('46MD) after two years service in the Navy is located at Rochester, Minnesota, taking a fellowship in pediatrics at the Mayo Foundation. He was married to Merry H. Ekblad last April. Dr. Drake is the son of Dr. Charles R. Drake ('09).

Kellogg Foundation Lectures

The following lectures will be given during the week of November 15. All medical students, interns, nurses, technicians, dietitians, and physicians are cordially invited to attend these lectures. A special invitation is extended to University Fellows.

Dr. Leo T. Samuels	Physiology of the Pituitary Gland	Wed., Nov. 17, 1:00 p.m. Todd Amphitheater, U. H.
Dr. K. W. Stenstrom	Radiation Therapy of Tumors of the Female Genital Tract	Fri., Nov. 19, 2:00 p.m. Eustis Amphitheater, U.H.