Bulletin of the

University of Minnesota Hospitals

and

Minnesota Medical Foundation

An Evaluation of Translumbar Aortography

Volume XXIV | Friday, March 6, 1953 | Number 20

BULLETIN OF THE
UNIVERSITY OF MINNESOTA HOSPITALS
and
MINNESOTA MEDICAL FOUNDATION

Volume XXIV | Friday, March 6, 1953 | Number 20

INDEX

Published weekly during the school year, October to June, inclusive.

The Bulletin is sent to members of the Minnesota Medical Foundation.
Annual membership fee - $10.00

Address communications to: Staff Bulletin, 3330 Powell Hall, University of Minnesota, Minneapolis 14, Minn.

I. AN EVALUATION OF TRANSLUMBAR AORTOGRAPHY

C. D. Creevy, M.D.
R. W. Krumbach, M.D.
W. E. Price, M.D.

The term aortography is used in the following presentation to mean the visualization of the abdominal aorta and its principal branches, abdominal viscera and, in some cases, large abdominal veins. Though the method was employed more than twenty-five years ago and many recent advances have been made in the technique to increase its safety and diagnostic value, aortography is even now regarded in many medical circles as a medical curiosity. This attitude probably stems from the great reluctance of many physicians to perforate the walls of major arteries. However, Smith, Rush, and Evans[49] have reported a series of more than one thousand cases without hemorrhage or other mishap.

In urologic diagnosis, aortography will probably remain a supplemental diagnostic procedure. Most disorders of the upper urinary tracts can be delineated by means of pyelography. However, the shortcomings of this technique are well recognized, and in certain cases, only the visualization of secondary changes in renal vascular patterns will suggest the correct diagnosis. Aortography has been found to be of primary importance in discovering the pathologic changes involving the abdominal aorta or its terminal branches, the common iliacs. It also may be useful as the only method available for discovering the nature of some intra-abdominal lesions short of actual abdominal exploration.

Translumbar aortography had its beginning with dos Santos,[14,15,16,17,18] who noted several cases in which bullet wounds through the aorta did not bleed. He also observed that there were no reported cases of hemorrhage following splanchnic block or paravertebral block anesthesia, though the aorta was frequently punctured inadvertently. The technique of dos Santos remains essentially unchanged today[18]. In 1934, dos Santos demonstrated his techniques in the United States. One of his first demonstrations was at the University of Minnesota Hospitals. Dr. Keller Doss, then an intern at the University of Minnesota Hospitals, became interested and later published accounts of his early work with aortography[9,10,11,12,13]. Other men, such as Wagner[51,52] and Nelson[35], used the approach, but the general reception in this country was one of limited enthusiasm. In 1951, Smith, Rush, and Evans[47] reported three hundred and fifty cases in which aortography was successfully accomplished without complications; and in 1952[49], these authors had increased their cases to one thousand. Their publications have aroused a considerable interest and more widespread acceptance of aortography in the United States.

This report presents a modified technique of aortography, which is intended to improve its safety and accuracy.

Successful aortography depends upon the availability of a suitable contrast agent, which should be neutral, isotonic, non-irritating, non-toxic and densely radiopaque. No such ideal agent is available at the present time. Dos Santos and Doss used 80% sodium iodide and technically excellent roentgenograms were obtained. However, due to the local and systemic toxicity of sodium iodide, this agent is not used today. Concentrated solutions cause marked vasopasm, endothelial changes and thrombosis when injected into peripheral arteries[3,4]. Toxic systems are characterized by nausea, excessive salivation and lacrimation, bronchial irritation, skin rashes, and delayed cerebral depression. Deaths following aortography[53] have all been due to marked angiospasm and necrosis of the bowel, following the accidental injection of sodium iodide into the superior mesenteric artery.

Several other contrast agents are known and their application to aortography has been considered. Diodrast has been extensively employed for excretory urography, but it has caused more deaths than any other agent[6,8,25,41]. The fatality rate is about one in fifty thousand injections. Due to the relatively high incidence of sudden allergic deaths fol-

lowing intravenously administered diodrast, its use for aortography is considered unsatisfactory. Neo-Iopax enjoys the reputation of having never caused the death of a patient after its intravascular administration. The worst disadvantage of Neo-Iopax is the marked vasospasm that occurs with intravenous or intra-arterial injection. While less irritating than sodium iodide, it causes more vasospasm than other available organic iodides[24]. In the course of this study, a single intra-aortic injection of 40 cc. of 75% Neo-Iopax was made under pentothal-curare anesthesia in an arteriosclerotic patient with moderately severe hypertension (160 to 170 mm. Hg systolic and 90 to 98 mm. Hg diastolic). A severe sustained hypertension of 210 to 230 mm. Hg systolic and 120 to 130 mm. Hg diastolic resulted which lasted for more than forty-five minutes. Similar reactions with other organic iodides were not observed.

Urokon is the most densely radiopaque organic iodide[34]. No fatalities have been reported following its use[36,43,44]. Urokon is available commercially in 30% and 70% solutions, and a supply of the 70% solution was kindly supplied to the University of Minnesota Hospitals for clinical investigation by Mr. Melvin Thorpe of the Mallinckrodt Chemical Works. The use of the concentrated solution in humans is insufficient for accurate evaluation of its relative safety[37]. Recently, a patient at the University of Minnesota Hospitals was observed who went into anaphylactic shock following the administration of 20 cc. of 70% Urokon for excretory urography. This experience indicates that the agent given intravenously is potentially dangerous. However, experimentations on animals indicate that it is less toxic than diodrast or Neo-Iopax[38]. Seventy percent Urokon has been observed to cause less tissue reaction and angiospasm than 35% or 70% diodrast, 70% sodium iodide or 75% Neo-Iopax[34]. Due to its relatively non-irritating and non-toxic qualities, and because it is the most radiopaque organic iodide, 70% Urokon most nearly approaches the level of an ideal contrast agent for aortography.

Successful aortography must be performed as simply and safely as possible. Speed and timing are of paramount importance, for the swiftly moving arterial stream rapidly dilutes and sweeps away the opaque contrast agent. Many techniques have been devised to attain these aims, such as the left ventricular puncture method of Nuvoli[39] for thoracic aortography and retrograde aortography through the brachial, carotid and femoral arteries as described by Saito and Kamikawa[45], Broden[2], Castellanous and Pererias[4], Farinas[22] and Hoyes and del Campo[30]. These techniques are marked by many complications, some of which are frequent hematomas[40], dislodgement of arteriosclerotic plaques[7,29] and difficulty in finding suitable arteries for the puncture[26]. It is generally conceded that translumbar aortography is safer than the retrograde approach[20].

The method of translumbar aortography of dos Santos[14] is the one generally in use. It is simple and easily performed in most adults. In children, with their small elastic aortas, the puncture is more difficult. Goodwin, Scardino, and Scott[26] attempted aortic punctures in five children, and in only one case was success achieved. Hemorrhage at the site of the aortic puncture is no problem with translumbar aortography as it is with aortography through peripheral arteries. The periaortic fascia quickly seals off the puncture site. Smith, Rush, and Evans[47] did translumbar aortic punctures on thirteen-moribund patients, and subsequent autopsies showed no hematoma larger than two centimeters in diameter. A few of these patients had arterial blood pressures of over 140 mm. Hg diastolic. In about five thousand translumbar aortic punctures collected from the literature, there is no reported instance of hemorrhage. A fatality is reported[53] following injection of the superior mesenteric artery. Sante[46] found that the level of origin of this artery is almost always below the lower border of the twelfth thoracic vertebra, therefore if injections are made above this level, the accident is not likely to occur.

The roentgenological technique used with translumbar aortography is similar

to that used in retrograde or excretory urography. High voltage rotating anode tubes which permit short exposures are very desirable, though probably not essential. Rapid cassette changers would be ideal, allowing the exposure of several films during the arterial and venous phases. However, entirely successful devices of this type are not yet available.

A technique of translumbar aortography that has given consistently satisfactory results has been evolved by one of the authors, Dr. R. W. Krumbach. A five inch sixteen gauge needle fitted with a stylet is used. In order to obtain rapid injection of the contrast agent, a standard Becton-Dickenson 40 cc. veterinary syringe with a rubber piston and glass cylinder is used because there is less friction and less danger of jamming than with the all metal or all glass instruments. The technique may be described as follows. The patient is given two ounces of milk of magnesia the preceding night and breakfast is withheld. The procedure is almost performed under solium pentothal anesthesia with an endothracheal tube in place. This permits controlled respirations and prevents voluntary movement on the part of the patient. It must be emphasized here that an experienced, well trained and cooperative anesthetist is essential, since uncontrolled breathing or struggling after the needle is in place can prevent a successful examination. An occasional cooperative individual may have the examination with anesthesia produced by local infiltration with procaine. The patient is placed prone over the x-ray cassette. A scout film is taken to check position and technique. A twenty-five centimeter length of polyethylene tubing with "Luer-Lok" adapters at each end is attached to the syringe and 40 cc. of 70% Urokon solution is drawn up.

The needle is introduced through the skin 6 to 8 cm. lateral to the midline just below the left twelfth rib. It is directed cephalad, medially and anteriorly to strike the body of the eleventh thoracic vertebra. By directing the needle about twenty degrees cephalad, the opaque agent is injected against the arterial stream, thus obtaining briefly a high concentration of the agent just above the renal arteries. After the body of the eleventh thoracic vertebra has been encountered, the needle is withdrawn and redirected so as to pass to the left of the vertebral body. Several attempts at this point may be necessary to slide the needle around the lateral edge of the vertebra. The stylet is then withdrawn, the needle advances slowly and as the wall of the aorta is punctured, a slight resistance is felt similar to that which is encountered with the dura mater during spinal puncture. Bright red arterial blood then spurts from the needle. The needle is turned slowly to each quadrant and if the spurting blood ceases, the tip of the needle is probably in the wall of the aorta and should be advanced another half centimeter into the aortic lumen. The polyethylene tube is then attached securely to the needle, and impulses in the admixture of blood and contrast agent may be seen if the needle is still in the proper position.

The patient's respiration are controlled either by the anesthetist or voluntarily. Using both hands, the injection is made in from three to four seconds. As the last 5 to 8 cc. of opaque medium is being injected, the technician makes the first exposure, outlining the arterial phase (the aorta and its major branches). The needle is quickly withdrawn, and two more exposures are made as rapidly as possible, each requiring about four seconds. These exposures outline the venous phase of the examination.

The important contraindications to aortography are iodine sensitivity, impending gangrene of the lower extremities where slight arterial spasm might precipitate tragedy and the presence of bleeding tendencies or concomitant anti-coagulant therapy. Uremia is not considered as a contra-indication to the procedure and it often presents a definite indication where a decreased renal function prevents satisfactory excretory urography and makes retrograde pyelography dangerous.

A considerable amount of information

can be gained by aortography. The outline of the aorta and its major branches can be seen, and the extent and nature of arterial lesions can be estimated [1,21,23,29]. Sizes and variations in the course and distribution of normal or supernumerary vessels[12] and their relationships to one another and to various normal and abnormal organs can be visualized[30,31]. Collateral circulation around obstructive arterial lesions can be seen[40]. By the size of the blood supply, functional capacities of such organs as the kidneys can be estimated[13]. Renal lesions, such as enoplasms, cysts, atrophy, hypoplasia or aplasia, anomalies and arterial thrombosis, may be recognized[46,48]. It has been suggested by Doss that aortography is useful in determining the possible role of unilateral renal disease in causing hypertension, and in determining the functional capacity of a hydronephrotic kidney in which the excretory ability is inhibited by obstruction to the urinary outflow. Aortography has been used to visualize obstetrical complications such as placenta praevia [5,27,28]. Dos Santos believed that the renal parenchyma is neither better nor worse than its blood supply. He used aortography in cases of ureteral calculus in which the involved kidney was nonfunctional on excretory urography and the ureter was blocked to the catheter, in order to decide whether renal inhibition was temporary or permanent.

In this study, 112 aortic punctures were made on 107 patients. The described technique was used in 83 of these. The oldest patient was 78 years; the youngest 17 years. Eighteen patients were hypertensive with diastolic pressures above 120 mm. Hg. Eight patients were uremic, and 7 patients had cirrhosis of the liver. One patient had Proteus septicemia and was deeply jaundiced from toxic hepatitis when the aortogram was made. Nine patients had severe arterial disease with absent femoral pulses but no evidence of gangrene.

In 6 patients, opaque medium was inadvertently extravasated into the periaortic tissues. Only mild lumbar pain lasting three to four days was noted in five of these individuals. The sixth patient represents the only instance where serious complications were noted following aortography. The patient is a 44 year old female who was recovering at the time from acute infectious hepatitis. She was slightly jaundiced, otherwise a physical examination was non-contributory. Aortography under pentothal-curare anesthesia was performed, in order to visualize possible abnormalities in the hepatic artery or its branches. Difficulty was encountered with administering the anesthesia and with placing the needle in the aorta. It is thought that the patient became hypoxic during the procedure. X-rays made during and after injection showed the contrast agent to be in the peri-aortic tissues and the aortogram was not obtained. Following the procedure, the patient developed paresis of the left lower extremity and urinary retention. There was a gradual improvement, and at the present time, three and one-half months following aortography, all functions have returned to normal. The exact cause of this unfortunate complication is not known. The possibilities that have been considered are: 1. Idiosyncrasy to iodine 2. Hypoxia, with central nervous system damage 3. Local arterial spasm, with spinal cord damage due to anoxia 4. Intraspinal injection of contrast medium. There was no x-ray evidence to support the latter possibility.

In 60 patients, aortograms were made because of pyelographic deformities. Twenty-one unilateral renal parenchymal neoplasms were diagnosed and demonstrated at operation. Three patients with bilateral renal neoplasms were seen, but only one was operated upon. Three patients were shown to have local recurrences of hypernephroid carcinoma two to fifteen years after nephrectomy. Nine patients were demonstrated to have single or multiple simple cysts. One patient with renal infarction, two with polycystic disease, one with congenital renal aplasia and four with fetal lobulations were investigated but not explored. Seven patients had aortograms for the diagnosis of arterial disease, such as aortic aneurysm and iliac or aortic occlusion. Three cases of pancreatic disease (one carcinoma and two large cysts) were

diagnosed and later verified. Three hypertensive patients were shown to have unilateral small renal arteries and compensatory hypertrophy of the opposite kidney. Nephrectomy had no effect on the hypertension in one case, another patient has remained normotensive for nine months postoperatively, and the last patient has had too brief a postoperative period for evaluation.

The total number of patients studied is too small to permit generalization or statistical analysis. Therefore, representative cases will be presented, which illustrate clinical applications, and specific problems in diagnosis.

DISCUSSION

Translumbar aortography was conceived about 25 years ago, but due to unsuitable contrast agents for intra-arterial injection, faulty technique and a great reluctance on the part of physicians to puncture the abdominal aorta, the method has had very limited use until recently. Aortograms of good quality have been obtained safely at the University of Minnesota Hospitals, using the technique described above. Though many of the patients examined had complicating diseases such as hypertension, uremia, liver disease, diabetes, heart disease and emphysema, only one important complication occurred. This complication followed anesthetic difficulties and local extravasation of contrast agent.

Due to the limitations in excretory and retrograde pyelography, an additional diagnostic procedure for urologic diagnosis has long been desired. Aortography has been shown to be a real aid in the diagnosis of parenchymal renal neoplasms, metastatic lesions, renal cysts, the nature of obscure pyelographic and nephrographic deformities such as fetal lobulation and congenital renal malrotation, displacements, and renal hypoplasia or atrophy. The relatively avascular neoplasms of the renal pelvis are not visualized by aortography. The method may be employed to judge the functional capacity of hydronephrotic or calculus bearing kidneys by estimating the richness or paucity of blood supply. The diagnostic possibilities are not limited to the urinary tract. Aortography may be a real aid in the diagnosis of hepatic, splenic and pancreatic lesions, and evaluating conditions of the large blood vessels of the abdominal cavity. Many more cases must be investigated by aortography, however, before generalizations can be made and correct evaluations given concerning the entire diagnostic spectrum of the procedure.

CONCLUSIONS

1. The historical background indicates a need for continued study of the technique of aortography.

2. An evaluation of the factors influencing the attainment of a safe and reproducible procedure has been presented.

3. A technique for accomplishing this aim is presented.

4. Representative cases are shown to demonstrate the diagnostic possibilities of aortography.

5. The method described has been found to be safe and efficient as a diagnostic supplement in selected cases.

6. Aortography has been useful in recognizing renal cysts, renal parenchymal neoplasms, extension and recurrence of renal neoplasms, and in the differentiation of extrinsic and intrinsic renal deformities.

REFERENCES

1. Boyd, W. M.
Thrombosis of the terminal aorta with aortitis and periarteritis. Report of two cases treated by aortectomy, lumbar sympathectomy and inferior vena cava ligation.
Rocky Mountain M. J. 47:936, 1950.

2. Broden, B., Hanson, H. E., and Karnell, J.
Thoracic aortography. Preliminary report.
Acta. Radiol. 29:181, 1948.

3. Campi, L., and Abeatici, S.
Experimental studies of the histological lesions of the arterial walls caused by iodine contrast media used in arteriographs.
Radiol. Med. (Milan) 36:312, 1950.

4. Castellanous, A., and Pererias, R.
Counter current aortography.
Rev. Cubana de Cardiol. 2:187, 1940.

5. Coutts, W. E., Opazo, L., Banderas, T., and Sandhueza Donoso, O.
Abdominal circulation during late pregnancy as shown aortograms.
Am. J. Obst. and Gyne. 29:366, 1935.

6. Crane, J. J.
Sudden death following intravenous administration of diodrast for intravenous urography.
J. Urol. 42:745, 1939.

7. Deterling, R., Jr.
Direct and retrograde aortography.
Surgery 31:88, 1952.

8. Dolan, L. P.
Allergic death due to intravenous use of Diodrast.
J. A. M. A. 139:114, 1940.

9. Doss, A. K., Thomas, H. C., and Bond, T. R.
Renal arteriography - its clinical value.
Texas State J. Med. 38:277, 1942.

10. Doss, A. K.
Translumbar aortography. An apparatus for injecting the radiopaque media.
Surg. 16:422, 1944.

11. Doss, A. K.
Translumbar aortography. Its diagnostic value in Urology.
J. Urol. 55:594, 1946.

12. Doss, A. K.
Management of ureteropelvic juncture obstruction; translumbar aortography an adjunct.
J. Urol. 57:521, 1947.

13. Doss, A. K.
Translumbar aortography; aid in management of hydronephrotic kidney.
South Med. J. 40:376, 1947.

14. dos Santos, R., Lamas, C., and Caldas, P.
L'Arteriographie des membres d l'aorte et de ses branches abdominal aorta.
Med. Contemp., Lisb. 47:93, 1929.

15. dos Santos, R., Lamas, C., and Caldas, P.
Recent progress in the technique of arteriography of the abdominal aorta.
Presse Med. 39:574, 1931.

16. dos Sontos, R., Lamas, C., and Caldas, P.
Arteriographie des membres et de l'aorte abdominale Masson et cie.
Paris, 1931.

17. dos Santos, R.
L' Aortographie daus les tumerurs renales et pararenales.
Arch. d. mal. d. reins. 8:313, 1934.

18. dos Santos, R.
Nuvelles applications cliniques de l'aortographie a quelques problems de chircurgie re' nale.
Bull. Soc. franc. d' Urol. 6:48, 1934.

19. Editorial comment:
J.A.M.A. 114:347, 1940.

20. Editorial comment:
J.A.M.A. 148:652, 1952.

21. Elkin, D. C., and Cooper, F. W., Jr.
Surgical treatment of insidious thrombosis of the aorta. Report of ten cases.
Ann. Surg. 130:417, 1949.

22. Farinas, P. L.
A new technique for the aortographic examination of the abdominal aorta and its branches.
Am. J. Roentgenol. 46:641, 1941.

23. Farinas, P. L.
Retrograde abdominal aortography.
Am. J. Roentgenol. 55:448, 1946.

24. Friedman, L. S., Lobsenz, H., and Jaurenig, R.
Pyelography by rapid injection. Description of an improved method and results in 200 cases.
Am. J. Roent. and Rad. Therapy. 62:84, 1949.

25. Goldburgh, H. L., and Baer, S.
Death following the intravenous administration of Diodrast.
J. A. M. A. 118:1051, 1942.

26. Goodwin, W. E., Scardino, P. L., and Scott, W. W.
Translumbar aortic puncture and retrograde catheterization of the aorta in aortography and renal arteriography.
Ann. Surg. 137:944, 1950.

27. Hartnett, L. J.
Visualization of the arterial circulation at the site of the placenta, (placentagrams).
J. Missouri State M. A. 44:745, 1947.

28. Hartnett, L. J.
Possible significance of arterial visualization in diagnosis of placenta previa.
Am. J. Obst. and Gynec. 55:940, 1948.

29. Helmsworth, J. A., and McGuire, T. and Felson, B.
Arteriography of the aorta and its branches by means of a polyethylene catheter.
Am. J. Roent. and Rad. Therapy 64:196, 1950.

30. Hoyes, J. M., and del Campo, C. G.
Angiography of the thoracic aorta and coronary vessels with direct injection of an opaque solution into the aorta.
Radiology 50:211, 1948.

31. Leriche, R., and Moree, A.
Syndrome of thrombotic obliteration of the aortic bifercation.
Ann. Surg. 127:193, 1948.

32. Leriche, R., and Kumlin, J., and Baely, C.
Lessons of aortography.
Angiology 1:109, 1950.

33. Leriche, R., Beaconsfield, P., and Coletle, B.
Aortography: Its interpretation and value. Report of 200 cases.
Surg., Gynec. and Obst. 94:83, 1951.

34. Melick, W. F., Byrne, J. B., and Beler, T. D.
The experimental and clinical investigation of various media used in translumbar aortography.
J. Urol. 67:1019, 1952.

35. Nelson, O. A.
Arteriography of abdominal organs by aortic injection: A preliminary report.
Surg., Gynec., and Obst. 74:655, 1942.

36. Nesbit, R. M., and Lapides, J.
Observations of Urokon. A new excretory pyelographic medium.
Univ. of Mich. Med. Bull. 16:37, 1950.

37. Nesbit, R. M., and Nesbitt, T. R.
Experiences with high concentration Urokon for pyelography.
Univ. of Mich. Med. Bull. 18:225, 1952.

38. Newhaus, D. R., Christman, A. A., and Lewis, H. B.
Biochemical studies on Urokon. (Sodium 2,4,6-Triiodo-3-Acetylaminobenzoate).
J. of Lab and Clin. Med. 35:43, 1950.

39. Nuvoli, I.
Arteriographia dell 'aorta toracica mediante puntura dell 'aorta ascendente o del ventriculo s.
Policlinico (sez prat) 43:277, 1936.

40. Pierce, C. E. 2nd.
Percutaneous arterial catheterization in dogs with special reference to aortography.
Ann. Surg. 133:544, 1951.

41. Pendergrass, E. P., Chamberlain, G. W., Godfrey, E. W., and Burdick, E. D.
Survey of deaths and unfavorable sequelae following the administration of contrast media.
Am. J. Roentgenol. and Rad. Therapy 48:741, 1942.

42. Price, A. H., and Wagner, F. B., Jr.
Complete occlusion of the abdominal aorta: Report of two patients diagnosed by aortography.
Surg., Gynec. and Obst. 84:619, 1947.

43. Richardson, J. F., and Rose, D. K.
Clinical evaluation of Urokon in pyelography.
J. Urol. 63:1, 1950.

44. Robbins, L. L., Colby, F. H., Sosman, J. L., and Myler, R.
Excretory urography. A clinical trial of a new contrast medium (sodium 3-acetylamino-2,4,6-triiodobenzoate).
Radiology 56:1, 1951.

45. Saito, M., and Kamikawa, K.
A new modification for the injection method of arteriography (injection in refluence)
Am. J. Surg. 17:16, 1932.

46. Sante, L. R.
An evaluation of aortography in abdominal diagnosis.
Radiology 56:183, 1951.

47. Smith, P. G., Rush, T. W., and Evans, A. T.
An evaluation of translumbar arteriography.
J. Urol. 65:911, 1951.

48. Smith. P. G., Rush, T. W., and Evans, A. T.
The interpretation of translumbar arteriograms.
J. Urol. 66:145, 1951.

49. Smith, P. G., Rush, T. W. and Evans, A. T.
The technique of translumbar arteriography.
J.A.M.A. 148:255, 1952.

50. Smith, P. G., Evans, A. T., Ulsey, P. C., and Felson, P.
Translumbar arteriography. Its roentgenologic interpretation.
Am. J. of Roent. and Rad. Therapy. 58:152, 1952.

51. Wagner, F. B., Jr.
Arteriography in renal diagnosis. Preliminary report and critical evaluation.
J. Urol. 56:625, 1946.

52. Wagner, F. B., Jr., Price, A. H., and Swenson, P. C.
Abdominal arteriography: Technique and diagnostic application.
Am. J. Roentgenol. and Rad. Therapy. 58:591, 1947.

53. Wagner, F. B., Jr., and Price, A. H.
Fatality after abdominal arteriography.
Surg. 27:621, 1947.

54. Wall, B., and Rose, D. K.
The clinical intravenous nephrogram: Preliminary Report.
J. Urol. 66:305, 1951.

II. MEDICAL SCHOOL NEWS

Coming Events

March 9	Special Lecture; "Studies of Hepatic Structure and Function"; Dr. Allan L. Grafflin, Professor of Anatomy, Johns Hopkins University School of Medicine, Baltimore; Todd Amphitheater; 4:00 p.m.
March 26	Special Lecture; "Trace Elements in Biochemistry and Medicine," Dr. Burt L. Vallee, Associate in Medicine, Harvard Medical School, and Research Associate, Department of Biology, Massachusetts Institute of Technology; Owre Amphitheater; 4:00 p.m.
April 6-11	Continuation Course in Proctology for General Physicians
April 16-18	Continuation Course in Gynecology for Specialists

* * *

Dr. Horns Enters Military Service

The impact of national defense and the "Doctors-draft Law" on the Medical School is being felt with increasing sharpness. On March 17, Dr. Howard L. Horns will begin a two-year tour of active duty with the Army Medical Corps. For the past four years Dr. Horns has served, in outstanding fashion, as our Assistant Dean. During this time he has, we are sure, lightened the burden of Dean Diehl to a considerable extent, and he has handled the individual and collective problems of medical students with wisdom, understanding, and sympathy. As Assistant Professor and later Associate Professor of Medicine he has continued to be active in clinical medicine and bedside teaching despite heavy administrative duties. He will be sorely missed by his colleagues on the faculty and by the students, all of whom join in the hope that his military experience will prove interesting and profitable. We trust that the armed forces will utilize his many talents in an effective manner.

While Dr. Horns is on military leave of absence, Dr. William F. Maloney will be Acting Assistant Dean of the Medical School. Dr. Maloney's background is a rather unusual one, but one which is well suited to his new post. He holds a bachelors degree in Business Administration which he obtained prior to entering the Medical School in 1942. Following graduation in 1945, he served his internship at Alameda County Hospital in Oakland, California. The ensuing four years were spent at Glen Lake Sanatorium, both as a patient and later as a member of the staff. Since 1950, he has been a Fellow in the Department of Internal Medicine. This background in business administration, a sound knowledge of medicine, and a most personable manner will prove to be great assets to him in this important position.

* * *

Faculty News

On February 24, Dr. W. Lane Williams, Associate Professor of Anatomy, spoke at the Southwestern Medical School of the University of Texas in Dallas. He discussed "Experimental Alteration of the Nucleic Acid Content of Hepatic Parenchyma."

Dr. Lewis Thomas, Professor of Pediatrics and Medicine, will deliver the Annual Edward Gamaliel Janeway Lecture at Mount Sinai Hospital in New York on Friday, March 6. His subject will be "Implications of the Generalized Schwartzman Phenomenon in the Pathogenesis of Cardiovascular Disease."

* * *

(Continued on next page)

Publications of the Medical School Faculty

Abramson, M. and Heron, W.: Hypnosis in Obstetrics. Experimental Hypnosis, The MacMillan Company, New York, 1952.

Baker, Annie L. and Thomas, Gertrude T.: Professional Teamwork. J. Amer. Diet. Assn., 28: 1039, 1952.

Barr, R. N.: The Responsibility of the Practicing Physician and Health Department in the Care of the Aged. Minn. Med., 36:137, 1953.

Beinert, H., Von Korff, R. W., Green, D. E., Buyske, D. A., Handschumacher, R. E., Higgins, H., and Strong, F. M.: A Method for the Purification of Coenzyme A From Yeast. J. Biol. Chem., 200: 385, 1953.

Bell, E. T.: Hyalinization of the Islets of Langerhans in Diabetes Mellitus. Diabetes, 1: 341, 1952.

Bernstein, W. C., Ghent, C. H., and Rea, C. E.: Emphysema of the Leg Following Perforation of the Rectum. Minn. Med., 35:1138, 1952.

Bilka, P. J.: Intra-Articular Use of Hydrocortisone in Rheumatic Diseases. Minn. Med., 35:938,1952.

Bloch, H. S., Zimmermann, B., Mohaupt, M. J., Cohen, S. L., and Goldfine, M. M.: Paper Chromatography of the 'Pregnanediol' Fraction of Urine. Proc. Cent. Soc. Clin. Res., p. 11, Oct. 25, 1952.

Bofenkamp, B.: Indications for Bronchoscopy. Bul. Swedish Hospital, 3: 30, 1952.

Boies, L. R., Canfield, N., Carhart, R., and Keaster, J.: Hearing Loss in Preschool Children: A Guide for Diagnosis and Treatment. Trans. Amer. Acad. Ophth. Otolaryng., Sept., Oct., 1952.

Boyd, W. L. and Lichstein, H. C.: Effects of Nutrition on Aspartic Acid Deaminase System of Bacterium Cadaveris; Soc. Exper. Biology and Med., 81:424, 1952.

Boynton, R. E.: The Development of Student Health Services. Stud. Med., Oct., 1952.

Brozek, J.: Starvation and Nutritional Rehabilitation. J. Amer. Diet. Assn., 28: 917, 1952.

Carr, Charles W.: Studies on the Binding of Small Ions in Protein Solutions with the Use of Membrane Electrodes. I. The Binding of the Chloride Ion and Other Inorganic Anions in Solutions of Serum Albumin. Arch. Biochem. Biophys., 40: 286, 1952.

Cavanaugh, D. J. and Glick, D.: Determination of Cholesterol in Microgram Quantities of Tissue. Analytical Chem., 24: 1839, 1952.

Clarke, E. K.: Group Therapy in Rehabilitation, A Description of the Willow River Forestry Camp of The Minnesota Youth Conservation Commission. J. Fed. Probation, Dec., 1952.

Creevy, C. D. and Tichy, F. Y.: Etiology and Treatment of Urinary Lithiasis in Severe Poliomyelitis. A.M.A. Arch. Neur. Psych., 68: 539, 1952.

(Continued on next page)

Creevy, C. D. and Reiser, M. P.: Wilms' Tumors. J. Urol. Survey, 2: Oct., 1952.

Creevy, C. D.: Advances in Urology During the Past Twenty-Five Years. Surg., 32: 749, 1952.

Creevy, C. D.: Testicular Tumors. J. Lancet, 72: 486, 1952.

Creevy, C. D.: Observations Upon the Absorption of Urinary Constituents After Ureterosigmoidostomy: The Importance of Renal Damage. S. G. & O., 95: 589, 1952.

Creevy, C. D.: Facts About Ureterosigmoidostomy. J.A.M.A., 151: 2, 1953.

Epstein, S.: The Antigen-Antibody Reaction in Contact Dermatitis: A Hypothesis and Review. Ann. Allergy, 10: 633, 1952.

Epstein, S.: Tips for the Management of Infantile Eczema. Bul. Marshfield Clinic, 2: 16, 1953.

Fox, J. R.: Inside the British Health Plan. Minn. Med., 36: 125, 1953.

Glick, D.: The Future of Clinical Microchemical Analysis. Chem. Eng. News, 31: 139, 1953.

Grout, R. E.: Report of Visit to Western Germany; W.H.O. Report, MH./56.52.

Grout, R. E.: Report of Visit to Italy. Conference on Health Education of the Public, European Region, 1953.

Hagen, P. S.: Hemolytic Anemia. Minn. Med., 36: 128, 1953.

Halberg, F. and Visscher, M. B.: A Difference Between the Effects of Dietary Calorie Restriction on the Estrous Cycle and on the 24-Hour Adrenal Cortical Cycle in Rodents. Endo., 51: 329, 1952.

Halberg, F. and Engel, R.: The Application of the 24-Hour Eosinophil Rhythm to the Study of Seizure Mechanisms: I. Methods, II. Results. Epilepsia Third Series, 1: Nov., 1952.

Halberg, F.: Some Correlations Between Chemical Structure and Maximal Eosinopenia in Adrenalectomized and Hypophysectomized Mice. J. Pharm. Exp. Therapeutics, 106: 135, 1952.

Halberg, F. and Ulstrom, R. A.: Morning Changes in Number of Circulating Eosinophils in Infants. Proc. Soc. Exp. Biol. Med., 80: 747, 1952.

Halberg, F.: Some Physiological and Clinical Aspects of 24-Hour Periodicity. J. Lancet, 73: 20, 1953.

Hastings, D. W.: The Future and the Criminal. J. Lancet, 73: 33, 1953.

Hathaway, S. R. and Monachesi, E. D.: The Minnesota Multiphasic Personality Inventory in the Study of Juvenile Delinquents. Am. Soc. Rev., 17: 704, 1952.

Hemingway, A. and Nahas, G. G.: The Effect of Varying Degrees of Hypoxia on Temperature Regulation. Amer. J. Phys., p. 170, 1952.

Hemingway, A. and Nahas, G. G.: Effect of Hypoxia on the Metabolic Response to Cold. J. App. Phys., 5: 267, 1952.

III. UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
WEEKLY CALENDAR OF EVENTS

Physicians Welcome

March 9 - 14, 1953

Monday, March 9

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 Kremen, Moore, and Stenstrom; Todd Amphitheater, U. H.

11:30 - 12:30 Physical Medicine Staff Seminar; Studies of the Kinesiology of Occupational Therapy; Mrs. Ruby M. Overmann; Heart Hospital Auditorium.

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

12:30 - 1:30 Physiology Seminar; 214 Millard Hall.

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

4:00 - Pediatric Seminar; Pulmonary Stenosis with Left Shunt to Right Shunt; Paul Adams; Sixth Floor West, U. H.

4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.

4:30 - Public Health Seminar; 15 Owre Hall.

4:30 - 6:00 Physiology 114A and Cancer Biology 140 -- Research Conference on Cancer, Nutrition, and Endocrinology; Drs. Visscher, Bittner, and King; 129 Millard Hall.

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

*4:00 - Special Lecture; "Studies of Hepatic Structures and Function;" Dr. Allan L. Grafflin, Professor of Anatomy, Johns Hopkins University School of Medicine, Baltimore; Todd Amphitheater, U. H.

Ancker Hospital

8:30 - 10:00 Tuberculosis and Chest Conference; Auditorium.

2:00 - 3:00 Surgery Journal Club; Classroom.

Minneapolis General Hospital

9:30 - Pediatric Rounds; Eldon Berglund; Newborn Nursery, Station C.

10:30 - 12:00 Tuberculosis and Contagion Rounds; Thomas Lowry; Station M.

11:00 - Pediatric Rounds; Erling Platou; Station K.

Monday, March 9 (Cont.)

Minneapolis General Hospital (Cont.)

12:30 - Surgery Grand Rounds; Dr. Zierold; Sta. A.

1:00 - X-ray Conference; Classroom, 4th Floor.

2:00 - Pediatric Rounds; Robert A. Ulstrom; Stations I and J.

Veterans Administration Hospital

8:00 - 9:00 Neuroradiology Conference; J. Jorgens, R. C. Gray; 2nd Floor Annex.

9:00 - G. I. Rounds; R. V. Ebert, J. A. Wilson, Norman Shrifter; Bldg. I.

11:30 - X-ray Conference; J. Jorgens; Conference Room, Bldg. I.

2:00 - Psychosomatic Rounds; Bldg. 5.

Tuesday, March 10

Medical School and University Hospitals

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

9:00 - 12:00 Cardiovascular Rounds; Station 30, U. H.

12:30 - 1:20 Pathology Conference; Autopsies; J. R. Dawson and Staff; 102 I. A.

12:30 - 1:30 Physiology 114D -- Current Literature Seminar; 129 Millard Hall.

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

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

4:30 - EOG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.

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

Ancker Hospital

9:00 - 10:00 Medical X-ray Conference; Auditorium.

Minneapolis General Hospital

10:00 - Pediatric Rounds; Spencer F. Brown; Stations I and J.

10:00 - Cardiac Rounds; Paul F. Dwan; Classroom, Sta. I.

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

12:30 - Grand Rounds; Fractures; Sta. A.; Willard White, et al.

12:30 - Neuroroentgenology Conference; O. Lipschultz, J. C. Michael and Staff.

12:30 - EKG Conference; Boyd Thomes and Staff; 302 Harrington Hall.

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

1:00 - Neurology Grand Rounds; J. C. Michael and Staff.

Tuesday, March 10 (Cont.)

Veterans Administration Hospital

7:30 - Anesthesiology Conference; Conference Room, Bldg. I.

8:30 - Infectious Disease Rounds; Dr. Hall.

8:45 - Surgery Journal Club; Conference Room, Bldg. I.

9:00 - Liver Rounds; Drs. Nesbitt and MacDonald.

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

10:30 - Surgery Tumor Conference; L. J. Hay, J. Jorgens; Conference Room, Bldg. I.

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.

3:30 - 4:20 Clinical Pathological Conference; Conference Room, Bldg. I.

Wednesday, March 11

Medical School and University Hospitals

8:00 - 9:00 Roentgenology-Surgical-Pathological Conference; Paul Lober and L. G. Rigler; Todd Amphitheater, U. H.

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

12:30 - 1:30 Radioisotope Seminar; Subject to be announced; C. R. Hitchcock; 12 Owre Hall.

1:30 - 3:00 Physiology 114B -- Circulatory and Renal System Problems Seminar; Dr. M. B. Visscher, et al; 214 Millard Hall.

4:00 - 5:30 Physiology 114C -- Permeability and Metabolism Seminar; Nathan Lifson; 214 Millard Hall.

4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.

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

8:00 - 10:00 Dermatological-Pathology Conference; Review of Histopathology Section; R. Goltz; Todd Amphitheater, U. H.

Ancker Hospital

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

12:30 - 1:30 Medical Journal Club; Library

Minneapolis General Hospital

8:30 - 9:30 Grand Rounds; William P. Sadler and Staff; Sta. C.

Wednesday, March 11 (Cont.)

Minneapolis General Hospital (Cont.)

9:30 - Pediatric Rounds; Max Seham; Stations I and J.

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

11:00 - Pediatric Seminar: Arnold Anderson; Classroom, Station I.

11:00 - Pediatric Rounds; Erling S. Platou; Station K.

12:15 - Pediatrics Staff Meeting; Classroom, Station I.

1:30 - Visiting Pediatric Staff Case Presentation; Station I, Classroom.

Veterans Administration Hospital

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

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

2:00 - 4:00 Infectious Disease Rounds; Main Conference Room, Bldg. I.

4:00 - 5:00 Infectious Disease Conference; Wesley W. Spink; Conference Room, Bldg.I.

4:00 - Combined Medical-Surgical Conference, Conference Room, Bldg. I.

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

Thursday, March 12

Medical School and University Hospitals

8:00 - 9:00 Vascular Rounds; Davitt Felder and Staff Members from the Departments of Medicine, Surgery, Physical Medicine, and Dermatology; Heart Hospital Amphitheater.

9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

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

12:30 - Physiological Chemistry Seminar; Detoxification of Heterocyclic Compounds in the Body; Larry Howard; 214 Millard Hall.

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

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

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

4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.

5:00 - 6:00 Radiology Seminar; Treatment of Lymph Node Tumors; Charles M. Nice; Eustis Amphitheater, U. H.

7:30 - 9:30 Pediatric Cardiology Conference and Journal Club; Review of Current Literature 1st hour and Review of Patients 2nd hour; 206 Temporary West Hospital.

Ancker Hospital

8:00 - 10:00 Medical Grand Rounds; Auditorium.

Thursday, March 12 (Cont.)

Minneapolis General Hospital

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

10:00 - Pediatric Rounds; Spencer F. Brown; Station K.

10:00 - Psychiatry Grand Rounds; J. C. Michael and Staff; Sta. H.

1:00 - Fracture - X-ray Conference; Dr. Zierold; Classroom.

1:00 - House Staff Conference; Station I.

2:00 - 4:00 Infectious Disease Rounds; Classroom.

4:00 - 5:00 Infectious Disease Conference; Wesley W. Spink; Classroom.

Veterans Administration Hospital

8:00 - Surgery Ward Rounds; Lyle Hay and Staff; Ward 11.

8:00 - Surgery Grand Rounds; Conference Room, Bldg. I.

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

Friday, March 13

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.

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

11:45 - 12:50 University of Minnesota Hospitals Staff Meeting; Irradiation Therapy in Hodgkin's Disease; Charles M. Nice, Jr.; Powell Hall Amphitheater.

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

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

4:00 - 5:00 Physiology 124 -- Seminar in Neurophysiology; Ernst Gelhorn; 113 Owre Hall.

4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.

5:00 - Urology Seminar and X-ray Conference; Eustis Amphitheater, U. H.

Ancker Hospital

1:00 - 3:00 Pathology-Surgery Conference; Auditorium.

Minneapolis General Hospital

9:30 - Pediatric Rounds; Wallace Lueck; Station J.

10:30 - Pediatric Surgery Conference; Oswald Wyatt; Tague Chisholm; Station I. Classroom.

Friday, March 13 (Cont.)

Minneapolis General Hospital (Cont.)

12:00 - Surgery-Pathology Conference; Dr. Zierold, Dr. Coe; Classroom.

1:00 - 3:00 Clinical Medical Conference; Thomas Lowry; Classroom, Station M.

1:15 - X-ray Conference; Oscar Lipschultz; Classroom, Main Bldg.

2:00 - Pediatric Rounds; Robert Ulstrom; Stations I and J.

Veterans Administration Hospital

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

1:00 - Pathology Slide Conference; E. T. Bell; Conference Room, Bldg. I.

Saturday, March 14

Medical School and University Hospitals

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

9:00 - 10:00 Infertility Conference; Louis L. Friedman, David I. Seibel, and Obstetrics Staff; Station 54.

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

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

9:15 - 10:00 Surgery-Roentgenology Conference; L. G. Rigler, J. Friedman, 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 Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.

Ancker Hospital

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

Minneapolis General Hospital

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 - 11:15 Hematology Rounds; Drs. Hagen, Goldish, and Aufderheide.
11:15 - 12:00 Morphology . . . . . Dr. Aufderheide.

* 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.