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Testicular Tumors

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I. TESTICULAR TUMORS

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C. D. Creevy, M.D.

INTRODUCTION

Primary neoplasms of the testicle are rare tumors which occur most frequently in young men; over 95 per cent are malignant. Unlike tumors in other organs they bear no resemblance histologically to the structures from which they originate. Classification and treatment are difficult because of their varied histologic appearance. Investigators have sought for many years for a common factor in the relationships between the different types of testicular neoplasms.

HISTORICAL

St. Donat in 1696 identified a rudimentary skull and optic cups in a testicular tumor. In 1845 Cooper first classified testicular tumors into two large groups according to the prognosis. Monad and Arthand in 1887 based their classification on embryologic pathology. In 1883 Kocher (according to Chevassu) performed two radical orchiectomies. Chevassu in 1906 formulated the first modern classification of testicular tumors. The radiosensitivity of seminomas was described in 1906 by BeClere. Ewing considered almost all of these neoplasms to be teratoid in nature, derived from a totipotent germ cell. An elevation of gonadotropin excretion in the urine of some patients with testicular tumors was discovered by Zondek in 1929.

ORIGIN

The cause of testicular tumors, as of all tumors, remains obscure. Present opinion holds neoplasms of the male gonad to be tridermal and derived from isolated blastomeres, one or more of the components of which may undergo malignant change (Friedman 12). The immaturity of the cells of the cryptorchid organ is believed to account for its more frequent involvement with cancer. Although others suspect trauma in the pathogenesis of testicular neoplasia, Ewing believes that a single trauma is incapable of producing a new growth. There is no familial tendency.

INCIDENCE

The incidence of testicular neoplasms is estimated at less than one in 50,000 living males (0.0002 per cent) in the United States (Lewis 30) (Gilbert & Hamilton). They comprise between one-half and two per cent of all malignancies in men and 3.39 per cent of those in the genito-urinary tract (Dean, Scully & Parkman). A testicular tumor is seen approximately once in every 1500 hospital admission (Gray, Thompson & McDonald).

Neoplasms occur more frequently in ectopic testes (Hinman 23). About 0.23 per cent of all males have a cryptorchid testis (Campbell). Neoplasia was associated with ectopy in 11 per cent of 7,000 patients reviewed by Gilbert and Hamilton, 15 per cent of 364 tumors reported by Dean, and 9.6 per cent of 94 cases in Hickenbotham's series. Orchiopexy does not decrease the indicence of these tumors (Kaplan & Roswit). In patients with cancer and unilateral ectopy, the ectopic side is involved in 97.5 per cent (Gilbert and Hamilton). Eighty per cent of ectopic testicular tumors are seminomas (Friedman and Moore). Tumors more frequently involve the right gonad[4,11,17,20,33,37]. This has been ascribed to more frequent ectopy on the right.

CLASSIFICATION AND PATHOLOGY

The study of testicular tumors is difficult because there is no generally accepted pathologic classification. The varied histologic pattern has led to a confusing maze of terminologies. At the University of Minnesota Hospitals we adhere to E.T.Bell's classification which is:

"Adult teratomas may be typical dermoid cysts. On microscopic examination they are found to consist of differenti-

ated tissue derived from the various organs such as cysts lined by squamous or glandular epithelium, smooth muscle, striated muscle, cartilage, brain tissue, liver, bone, etc. Occasionally there are areas of embryonic tissue of malignant type. These are rare tumors.

"Carcinomatous mixed tumors are soft cellular growths consisting chiefly of epithelium in the form of cysts or solid masses of carcinomatous structure. Cartilage and myxomatous tissue may be found scattered through the tumor.

"Seminoma consists chiefly of rounded or polyhedral clear cells arranged in thick solid cords and bearing some resemblance to testicular tubules. Little or no cartilage is present in these neoplasms and they are more radiosensitive than carcinomatous mixed tumors.

"Chorio-epithelioma - exact duplicate of chorio-epithelioma found in the malignancies of placental tissue".

Dr. McCartney describes a teratoma as a tridermal tumor with organoid structures. In addition, several very rare varieties of tumor have been described: feminizing tumors (Lewis & Stockand), rhabdomyosarcoma (Hertzog), and interstitial cell tumors (James & Shape, Gharpure). Tumors of the supporting tissue not peculiar to the testis such as hemangioma, neurofibroma, and lymphosarcoma are also seen. Of these, lymphosarcoma is frequently bilateral and often assoicated with lymphosarcoma of the cutis.

Lewis[30] has evolved a clinical pathological classification which he regards as satisfactory in selecting therapy and for prognostic purposes. The classification is as follows:

I) Tumors of the supporting tissues
  A. Connective tissue
    1. Cysts of the tunica albuginea
    2. Fibroma
    3. Fibrosarcoma
      Fibroleiomyosarcoma
  B. Vascular tissue
    1. Hemangioma
    2. Endothelioma
  C. Lymphatic tissue
    1. Lymphoma
    2. Lymphosarcoma
    3. Hodgkin's disease
  D. Nerve tissue
  E. Mesonephric tissue (none described for the testis)

II)
  A. Tumors of the interstitial cells (virilizing)
    1. Benign
    2. Malignant
  B. Tumors of granulosa cells (feminizing)

III) Tumors of seminiferous tubules
  Fetal adenoma of the undescended testis (Sertoli cell tumors)

IV) Tumors of germ cell origin
  A. Seminoma or dysgerminoma
  B. Adenocarcinoma
    1. Undifferentiated embryonal carcinoma
    2. Embryonal adenocarcinoma
    3. Embryonal papillary adenocarcinoma
  C. Trophocarcinoma
    1. Cytotrophoblastoma
    2. Choriopapillary adenocarcinoma
    3. Chorio-epithelioma
  D. Immature teratoma with elements of A, B, or C.
  E. Mature teratoma with or without elements of A, B, or C.
    1. Dermoid cysts
    2. Rhabdomyosarcoma
    3. Organoid tumors

This classification is based on the hypothesis that a seminoma or dysgerminoma developing in the ovary or testicle is a primitive growth derived from artificially fertilized sex cells. Under maturing influences these fertilized cells may also develop into modified blastomeres destined to become embryonic carcinomas, teratomas, or chorio-epithe-

liomas. The more differentiated forms of primitive ectoderm, mesoderm, and entoderm may sometimes be seen in the same tumor.

It seems improbable that cartilage and other adult organoid structures could arrive in distant lymphatics as emboli. It is more likely that they form there by the maturation of metastases from the more primitive cell forms found in the blastomere. Lewis[30] says that he has recognized the blastomere in the distant metastases of some adult teratoid tumors.

Germ cell tumors are dynamic, not static. Primary and secondary tumors may evolve in separate directions. In the 922 cases reviewed by Friedman and Moore, metastases were usually histologically similar to the primary tumor but occasionally varied from organ to organ or place to place. In their study of primary tumors, embryonal carcinoma was associated with seminomatous metastases in 4 per cent and with chorio-epitheliomatous secondary deposits in 6 per cent. Pure chorio-epitheliomatous tumors comprised only 0.4 per cent of the whole series. Metastatic seminoma was rarely encountered from teratomas and mixed tumors associated with seminoma. Ninety per cent of their so-called embryonal carcinomas metastasized as embryonal carcinoma or chorio-epithelioma, and teratoid structures were rare. Forty per cent of metastases from terato-carcinomas consisted of embryonal carcinoma or chorio-epithelioma, whereas 60 per cent had teratoid structures. Only 7 per cent of tumors in the trophocarcinoma series failed to show chorio-epitheliomatous structures. Gray et al[18] found chorio-epitheliomatous elements in 5 per cent of 127 cases of teratoma. Therefore the most malignant cell form present in the primary tumor usually metastasizes, even though present in a small focus. The multiple block examination of the primary tumor enables one to make a more accurate prognosis.

Metastases usually occur early but may be delayed for many years[44]. About 60 per cent of patients have metastases when first seen[3,17,33]. The usual route is by way of the lymphatics to the aortic lymph nodes from the aortic bifurcation to the diaphragm and then to the external iliac group. Extension by way of the thoracic duct to the left subclavian nodes is common. Metastasis to the inguinal group is possible only with penetration of the tunica vaginalis and infiltration of the scrotal skin or by blockade of the iliac nodes and retrograde dissemination. Chorio-epithelioma metastasizes primarily by way of the blood stream. Seminoma disseminates more slowly, respects tissue planes, metastasizes as a sheet of cells rather than in discrete nodes, and rarely causes parenchymal lesions. A pure seminoma may occasionally metastasize as a more malignant cell type. In Friedman and Moore's series of 922 testicular neoplasms, there were 319 seminomas. Demonstrable metastases had occurred in but 28 of these, of which 11 or 39.3 per cent were of radioresistant types. The percentage incidence of various tumors cannot be stated accurately because of numerous different classifications. Over 95 per cent are of germ cell origin. Of these approximately one-third are seminoma and two-thirds teratoma, mixed tumors, and adenocarcinomas. Pure chorio-epithelioma, supporting tissue tumors, and benign tumors are rare.

SYMPTOMS

Painless gradual enlargement of the involved testicle is the most common complaint, and was the only symptom in approximately 90 per cent of the cases in various reported series (Gray, Thompson & McDonald; Dean; and Lewis[30]). Other initial symptoms in order of frequency are pain in the testicle or groin, sudden painful enlargement (Milner & Gilbert), and those disturbances referable to pulmonary and abdominal metastases (Lindgren). Symptoms referable to metastatic lesions in the absence of palpable tumors are especially prone to occur in chorio-epithelioma.

Feminizing tumors and chorio-epithe-

liomas may cause gynecomastia. Gordon-Taylor and Till report that 5.17 per cent of their patients had gynecomastia. Six per cent of Lewis'[30] series had no testicular mass, the diagnosis being made by accurate palpation on routine physical examination. Eleven per cent had symptoms due to metastases. Only 3 per cent of his patients with seminoma had symptoms referable to metastases without testicular enlargement; whereas 50 per cent with chorio-epithelioma had such symptoms. Patients with retained abdominal testicles may complain of an abdominal mass or may be admitted to hospitals as surgical emergencies.

Testicular neoplasms may occur at any age (Magner and Bryant) but are seen most frequently between the second and fourth decades. Seminoma appears in slightly older patients than do the other tumors (Friedman and Moore). Weakness, weight loss, anorexia, bowel obstruction, pain in the back and costovertebral angle, cough, dyspnea, and hemoptysis may occur late in the course of the disease.

DIAGNOSIS

An enlargement of the testicle proper must be regarded as malignant until the contrary has been proved at operation. The diagnosis is rarely difficult if the examiner keeps the possibility in mind. The easy accessibility of the scrotum to bimanual palpation makes the differential diagnosis relatively easy. Most frequently a discrete hard or cystic nodule may be palpated. In other instances the testicle may be simply enlarged without any apparent change in consistency or contour. The only sign may be a disproportionate weight and in rare instances there may be evidence of secondary metastases without local findings in the gonads.

Hydrocele is frequently associated with these tumors. Gray et al[17] found it in 11 per cent of their tumors. Hydroceles should be aspirated to facilitate palpation of the testicle. The recovery of bloody fluid is very suggestive of tumor. Varicocele, hydrocele of the cord, spermatocele, and epididymitis can be readily ruled out by bimanual palpation. The only difficulty encountered is in differentiating a thickened wall or calcified hydrocele, gumma, or hematocele. A calcified hydrocele may be diagnosed roentgenologically.

Virilization in prepubertal boys or gynecomastia (Gilbert 14) in persons having an enlarged testicle strongly suggests the presence of a gonadal neoplasm.

A chest X-ray and excretory urogram with delineation of the ureters are essential parts of the examination for metastases when tumor is suspected. Frequently retroperitoneal metastases cause deviation of the ureters from their normal course. The sedimentation rate may also be elevated. Despite the accessibility of the testicle, delay in the correct diagnosis is common. Twenty-five per cent of the patients seen by Lewis[30] were originally treated for epididymitis. Rigler describes pulmonary metastases as follows: "Metastases from testicular tumors have extremely large, somewhat oval, sharply defined shadows apparently unrelated to lung tissue. Their appearance is almost pathognomonic. Metastases from chorio-epithelioma cause similar changes". Metastases to the liver, brain, and skeletal system are less common. Left supraclavicular lymph nodes are frequently enlarged to palpation.

Quantitative hormonal bioassays are time-consuming, expensive, and of limited value. Only the chorionic hormone, and not the follicle stimulating hormone found in castrates, is diagnostic. A number of normal and hypophosectomized animals must be used to make results meaningful. The test was at first thought to be specific for certain tumors (Hinman 24), but this has proved not to be the case (Shively, Twombly et al). The test, when strongly positive, is confirmatory evidence of tumor. Occasionally an early recurrence may be detected. Absence of a positive test does not exclude a tumor.

Persons apparently cured of testicular neoplasms, especially cryptorchid individuals, deserve a very close follow-up. One per cent of patients with a tumor in a normally placed testicle develop tumor on the contralateral side (Hotchkiss and Laury). Twenty-four per cent of bilaterally cryptorchid individuals with a tumor develop bilateral tumor, a frequency 770 times greater than that expected in the general male population (Gilbert & Hamilton). Suspicion of tumor is an indication for exploration. The spermatic vessels and vas deferens may be clamped through an inguinal incision before the testicle is exposed. Biopsies are inadvisable for fear of implanting neoplastic cells outside the testis or of causing their dessemination via the blood stream.

TREATMENT

There is no general agreement on therapy for testicular tumors. Simple orchiectomy alone cures a small percentage of cases. Wasterlam states that the five year survival rate is less than 6 per cent. Simple orchiectomy and radiation therapy with the standard 220 kilo volt machine are most frequently used. Twenty-six patients with known metastases were treated by Cabot and Berkson with roentgen therapy after simple orchiectomy. In this group, 15.4 per cent of 13 with carcinoma survived five years and 61.5 per cent of 13 with seminoma survived five years.

Radical orchiectomy with removal of the testicle and spermatic cord as well as excision of the retroperitoneal lymph nodes and surrounding fat from the renal pedicle to the inguinal ligaments was described by Chevassu, abandoned by Young, limited to teratoma by Hinman[21,24], and recently revived by Lewis[31]. Hinman[21] did the radical operation on 14 patients without subsequent radiation. Four patients who had positive lymph nodes removed survived 14 years, 4 years, 1 year and another 3 months. Thus, surgical extirpation alone may give results.

Operability as in any malignant tumor depends on early diagnosis, and cure depends on control of the retroperitoneal lymph nodes. Lewis, who has probably had the greatest individual experience with testicular neoplasms, feels that the varied cellular structure suggests a varied therapy. He bases his selection of treatment on an accurate clinical and pathological diagnosis. His opinion, based on 250 personally treated cases, is that 1. Simple orchiectomy is sufficient for benign tumors; 2. Simple orchiectomy followed by radiation with the 220 kilo volt machine is adequate for seminoma; 3. Radical orchiectomy alone should be used for any adult teratoma, (These tumors are very radioresistant and prophylactic radiation is not without danger); and 4. Radical orchiectomy with prophylactic or definitive high voltage roentgen therapy should be used in all other testicular tumors.

Dr. Milton Friedman has estimated the dosage necessary for complete destruction of cells in the various types of testicular neoplasm as follows: seminoma 600 to 800 r; undifferentiated adenocarcinoma 2000 r; adenocarcinoma 3000 r; and chorio-epithelioma 5000 to 6000 r. There apparently is not a single reported case of pure chorio-epithelioma surviving after any form of therapy.

Friedman[10] feels that the one million volt x-ray machine is best suited to delivering the high dosage necessary in the radioresistant tumors. Radiation therapy is not without complications. Following a dose of 5000 r. with the 1,000,000 volt machine, 16 patients had perforations of the bowel, of these 10 died and 6 were saved by surgery, 3 others developed paraplegia. Radiation in this dosage is reserved for patients with known radioresistant inoperable metastases.

UNIVERSITY HOSPITAL SERIES

One hundred and fifty cases of testicular tumor have been seen at the University Hospitals since 1923. Results

of roentgen therapy in 100 cases have been reported by Kelby and Stenstrom. Drs. E. T. Bell and J. S. McCartney of the department of pathology at the University of Minnesota kindly confirmed the pathologic diagnosis in 102 cases where material was available for review.

The presenting symptoms are given below:

Table I

	Cases
Painless gradual enlargement	131
Painful enlargement	7
Symptoms from metastases	5
Sudden enlargement	3
Discovered at abdominal operation (undescended testes)	3
Discovered at operation for hydrocele	3
Enlarged breasts	2
Discovered on routine physical examination	1
Discovered at postmortem examination	1

Fifty-nine per cent of tumors occurred on the right side. Fifteen tumors occurred in patients with cryptorchidism, 12 on the right and 3 on the left. Four of these patients had had orchiopexy several years previously. One patient was bilaterally cryptorchid. In four patients with tumor in a normally placed organ the opposite testicle was cryptorchid. Thus 10 percent of the whole series occurred in patients with cryptorchidism.

There was a definite history of trauma in 10 percent of the cases, and 10 percent of the tumors were associated with hydrocele. The condition was originally misdiagnosed in 18 cases and treatment delayed 2 to 15 months. Mistaken diagnoses were traumatic orchitis, hydrocele, hematocele, epididymitis, and mumps orchitis. Hormone excretion studies were not conducted in a sufficient number of cases to warrant discussion.

The microscopic diagnosis in 102 cases reviewed by Drs. Bell and McCartney was as follows:

Table II

	Number	Average Age	Youngest	Oldest
Seminoma	54	39	16	76
Mixed	25	33	16	62
Teratoma	21	28	6	76
Lymphosarcoma	1	2	---	---
Chorio-epithelioma	1	27	---	---

RESULTS

Ninety-two of the 150 cases have had the pathologic diagnosis confirmed and have been followed more than 5 years. No cases were treated by radical orchiectomy alone. One case of adult teratoma treated by simple orchiectomy without irradiation because of its radioresistance, has survived 5 years. The single case of chorio-epithelioma died 20 days after the completion of his roentgen therapy. The case of lymphosarcoma died of lymphatic leukemia 4 months after therapy. One patient with a seminoma died during roentgen therapy with leucopenia and overwhelming infection. Seven cases were treated with radical orchiectomy and irradiation. All had metastatic nodes; in two cases gross tumor was left behind. Treatment in most of our cases consisted of simple orchiectomy and standard irradiation to abdominal lymph nodes. (Table III)

Nine patients had needle biopsy of their tumors elsewhere. Two of these with seminoma had orchiectomy followed by irradiation shortly thereafter and

Table III

Results at University Hospital

	Cases	Simple orchiectomy	5-20 yr. Survival	Radical orchiectomy with radiation	5-20 yr. Survival	Simple orchiectomy with radiation	5-20 yr. Survival	Total Survivors
Seminoma with metastases when first seen	26	0		4	1	22	5	6
Seminoma without metastases when first seen	21	0		0		21	17	17
Mixed tumors with metastases when first seen	11	0		0		11	0	0
Mixed tumors without metastases when first seen	11	0		0		11	3	3
Teratoma with metastases when first seen	14	0		3	0	11	0	0
Teratoma without metastases when first seen	7	1	1	0		6	0	1
	90	1	1	7	1	82	25	27

survived more than 5 years. The others died within 2 years. Two patients had bilateral tumors. It appears from table III that roentgen therapy with the standard 220 kilo volt machine does not provide adequate prophylactic or therapeutic treatment for testicular tumors other than seminoma.

It is difficult to compare our results with those of other series. Many of our patients were treated when roentgen therapy was not as well developed as it is today. In some cases, patients had orchiectomy elsewhere and were sent to this hospital for radiation only after metastases appeared. If the tumors are divided into two large groups, radiosensitive (seminomas) and radioresistant (teratomas, adult teratomas, mixed tumors and chorio-epitheliomas), a rough comparison may be made. (Table IV)

Table IV

	Radio Resistant	Radio Sensitive	
Patients	100	103	(Kimbrough)--treated by radical orchiectomy and irradiation with the 1,000,000 volt machine. Patients with inoperable pulmonary metastases probably were not included. All had a five year follow-up.
Survival Percentage	37	81	
Patients	27	48	(Cabot & Berkson)--patients without metastases treated by simple orchiectomy followed by radiation.
Survival Percentage	37	75	
Patients	14	121	(Cabot & Berkson)--patients with metastases treated by simple orchiectomy followed by radiation. (5 year follow-up)
Survival Percentage	14.3	42.9	
Patients	37	27	(Hickenbotham)--treated by simple orchiectomy and irradiation with standard 220 kilo volt machine. Patients with pulmonary or extra-abdominal metastases are not included. All had a five year follow-up.
Survival Percentage	24	52	
Patients	141	75	(O'Connell & Geschickter)--treated by simple orchiectomy and irradiation with 220 kilo volt machine and followed for five years.
Survival Percentage	19.1	59.6	
Patients	50	34	(Lindgren)--treated by simple orchiectomy with standard radiation. All were followed for three years or more.
Survival Percentage	9	50	
Patients	39	43	University of Minnesota Hospital series treated with orchiectomy and irradiation, all had a five year follow-up. 7 cases with radical orchiectomy and irradiation not included.
Survival Percentage	7.6	51	

The patients in series 1-2 & 4 are comparable in selection and follow-up. Radical orchiectomy with high voltage irradiation appears to give slightly better results.

The results of simple orchiectomy and irradiation with a standard machine in

the radioresistant tumors are better than simple orchiectomy alone, indicating that some tumors are more sensitive than others.

SUMMARY AND CONCLUSIONS

Testicular tumors are unique in that they are apparently derived from totipotent germ cells and may evolve into a variety of histologic types, 95 percent or more of which are malignant. The clinical findings, treatment and results of treatment in 92 patients with testicular tumor seen at the University of Minnesota Hospitals are described. An accurate pathological diagnosis, preferably by the multiple block technique is essential to proper treatment. A biopsy of metastases is desirable as they may differ from the primary lesion. Surgical and X-ray therapy should be varied with the expected radioresistance of metastases. Most seminomas behave as clinical entities, being more radiosensitive and offering a better prognosis. Simple orchiectomy and standard irradiation do not appear to be effective against radioresistant tumors.

REFERENCES

1. Be Clere, A.
Das Semnon des Hodens und de Ovariums
Strahentherapie, 50:597, 1936.

2. Bell, E. T.
Testbook of Pathology, Philadelphia, Lea & Febiger 6th ed. 460, 1947.

3. Cabot and Berkson
Neoplasms of the Testis
Staff Meeting, Mayo Clinic, 14:333, 1939.

4. Cabot and Berkson
Neoplasms of the Testis, A study of the results of orchiectomy with and without irradiation
N.E.J.M., 220:192, 1939.

5. Campbell, H. E.
Incidence of malignant growths of undescended testicle
Arch. Surg., 44:353, 1942.

6. Chevassu, M.
Tumeurs du testicle
Paris, 1906 (Paris theses, 1905-6).

7. Cooper, A. P.
Observations on structure and disease
Philadelphia, Lea & Blanchard, 1845.

8. Dean, A. L.
The diagnosis and treatment of testis tumors
N.Y. State Med. Jour., 51:485, 1951.

9. Ewing, J.:
Teratoma testes and its derivatives
Surg., Gynec. & Obst., 12:230, 1911.

10. Friedman, M.
Surpervoltage roentgen therapy at Walter Reed General Hospital
Surg. Clinic of N. A., 24:1424, 1944.

11. Friedman, N. B. & Moore, R. A.
Tumors testes with report of 922 cases
Mil. Surgeon, 99:573, 1946.

12. Friedman, N. B.
Comparative morphogenesis of extragenital and gonadal teratoid tumors
Cancer, 4:1951.

13. Gilbert, J. B. & Hamilton, J. B.
Studies in malignant testes tumors in ectopic testes
Surg., Gynec. and Obst., 71:731, 1940.

14. Gilbert, J. B.
Studies in malignant testes tumors, Syndrome of chorionic gynecomastia
J. Urol., 44"345, 1940.

15. Gharpure, V. N.
A case of malignant interstitial cell tumor of the testes in man
J. Path. & Bact., 62:113, 1950.

16. Gordon - Taylor, G. & Till, A. S.
On malignant disease of the testicle with special reference to neoplasms of the undescended organ
Brit. Jour. Urol., 10:1, 1938.

17. Gray, C. P., Thompson, G. J. & McDonald, J. R.
Clinical findings in 127 cases of teratoma of the testes
J. Urol., 64:690, 1950.

18. Gray, C. P., McDonald, J. R. & Thompson, G. J.
Chorio-epitheliomatous elements occurring in teratoma of the testes
Am. J. of Surg., 79:653, 1950.

19. Herzog, A. S.
Rhabdomyosarcoma of the testes, Report 2 cases
Am. J. Cancer, 28:131, 1936.

20. Hickenbotham, F. J.
Malignant tumors testicle
Brit. J. Urol., 22:87, 1950.

21. Hinman, F.
Radical operation for teratoma testes
Am. Jour. Surg., 28:16, 1935.

22. Hinman, F.
Teratoma testes in Oxford Loose-leaf Surgery, 3, 746, & 240, 1936.

23. Hinman, F. & Bentien, F. H.
Relationship of cryptorchidism to tumors of the testes
J. Urol., 35:378, 1936.

24. Hinman, F. & Powell, T. O.
Gonadotropic hormone in the urine of men with tumor of the testes
J. Urol., 34:55, 1935.

25. Hotchkiss, R. S. & Laury, R. B.
Concomitant bilateral malignant testicular tumors
J. Urol., 63:1093, 1950.

26. James. D. C. & Shape, R. D.
Interstitial cell tumor of the testicle with report of a case
J. Urol., 63:718, 1950.

27. Kaplan, G. & Roswit, B.
Bilateral testicular tumor following bilateral orchiectomy,
J.A.M.A. 144:1557, 1950.

28. Kimbrough, J. C. & Morse, W. H.
Treatment of malignancy of the testes
U.S. Armed Forces Med. Jour., 2:1353, 1951.

29. Kelby, G. M. & Stenstrom, K.
Treatment of malignant tumors of the testes
Radiology, 48:1, 1947.

30. Lewis, L. G.
Testes tumor, Advances in surgery
Vol. 2:419, 1949.

31. Lewis, L. G.
Radical orchiectomy for tumors of the testes
J.A.M.A. 137:828, 1948.

32. Lewis, L. G. & Stockhand, G. G.
Feminizing testes tumors,
J. Urol., 64:518, 1950.

33. Lindgren, M.
Metastases in malignant Tumors of the testicle
Acta. Cherugica Scandinavia, 101:127, 1951.

34. Magner, D. & Bryant, J. S.
Adenocarcinoma testes occurring in infants, Report 2 cases
A.M.A. Archives of Path., 51:82, 1951.

35. Milher, W. A. & Gilbert, J. B.
Painful malignant tumors of the testes with and without hemorrhage
J. Urol., 64:5, 697, 1950.

36. Monod, C. H. & Arthand, G.
Considerations sur la classification des tumeurs du testicle
Rev. de Chir., 7:165, 1887.

37. O'Connell, H. V. & Geschecter, C. F.
Tumor testes, 5 year follow-up study
U.S. Armed Forces, Med. Jour., 1: 719, 1950.

38. Rigler, L. G.
The chest., A handbook of roentgen diagnosis
The Yearbook Publishers, 237, 1946.

39. Scully, R. E. & Parkam, A. R.
Testicular tumors
Arch. Path., 45:581, 1948.

40. Shively, J. A.
Assay of gonadotropins in the diagnosis of neoplasm
U.S. Armed Forces, Med. Jour., 1: 505, 1950.

41. Twombly, G. H., Temple, H. M., & Dean, A. L.
Clinical value of the A.Z. test
J.A.M.A., 118:106, 1942.

42. Wasterlam
J. Belge d'urol., 3:149, 1932.

43. Zondek:
Malignant testicular tumors and anterior hyphoseal hormone,
B. Klin. Wchuschr, 11:274, 1932.

44. C. P. C.
Metastatic teratoma mediastinal lymph nodes from testes removed 14 years previously
N.E.J.M., 244:26, 1951.

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ERRATUM

Line 3, par. 3, page 312 of Bull. #16, Feb. 15, 1952

"in vivo methods" should read, "in vitro methods".

II. MEDICAL SCHOOL NEWS

Coming Events

Mar. 3-5 Continuation Course in Radiology for General Physicians
Mar. 20 E. Starr Judd Lectureship in Surgery; "Some Observations on the Treatment of Carcinoma of the Pancreas," Dr. Thomas G. Orr, Professor of Surgery, University of Kansas; Owre Amphitheater; 8:15 p.m.
Mar. 24-26 Continuation Course in Therapeutics for General Physicians
Apr. 7-9 Continuation Course in Surgery for General Physicians
Apr. 8 George E. Fahr Lectureship; "Coarctation of the Aorta," Dr. Robert E. Gross, Ladd Professor of Children's Surgery, Harvard Medical School, and Surgeon-in-Chief, Children's Hospital, Boston; Owre Amphitheater; 8:15 p.m.
Apr. 17-19 Continuation Course in Proctology for General Physicians

Continuation Course in Radiology

A continuation course in Radiology for General Physicians will be held at the Center for Continuation Study on March 3-5, 1952. This course is intended primarily for physicians engaged in general practice and will emphasize the roentgenological aspects of chest diseases and bone conditions. It will be presented under the direction of Dr. Leo G. Rigler, Professor and Head, Department of Radiology and Physical Medicine, and the other members of the faculty will include clinical and full-time members of the staff of the University of Minnesota Medical School and the Mayo Foundation.

Faculty News

Dr. Olof Larsell, Head of the Department of Anatomy of the University of Oregon Medical School and former Dean of the Graduate Division of the Oregon State System of Higher Education, has been appointed Professor of Neuroanatomy to succeed Dr. A. T. Rasmussen who retires in June. Dr. Larsell's appointment is effective at the beginning of the first summer session.

Clark Bequest

The University of Minnesota will inherit almost $400,000 in securities plus an interest in West Virginia coal lands from the estate of the late George S. Clark. Under the terms of the Clark will, the bequest is to be used "for the purpose of founding and endowing a research professorship in medicine". It is intended that this research be primarily in the field of hypertension.

Clark, who died in 1944, was a prominent Georgetown, South Carolina, lumberman. His early years were spent in this part of the country in association with the Carpenter lumber interests. Later, he was employed by J. P. Morgan to reorganize one of the largest lumber mills in the South, the Atlantic Coast Lumber Corporation of Georgetown. After completing this project, Clark retired to Minneapolis in 1942.

The bequest to the University consists of the residue of the estate after payment of cash legacies to a large number of Clark's relatives and friends and to Georgetown charities.

No restrictions are placed on the use of the principal or income of the fund, but it was Clark's wish that the efforts of the endowed professorship be devoted at first to the study of hypertension. Should the problem of hypertension at any time be considered solved, in the opinion of the University's medical authorities, the fund may be redirected toward the solution of "any similar worthy problem in research medicine whose solution would contribute greatly to humanity at large."

The will provides that direct supervision of the fund be in the hands of University Medical School officials, specifically the Dean and the head of the Department of Medicine. The bequest will be presented to the Regents of the University for acceptance at their next meeting, March 14.

III. UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
WEEKLY CALENDAR OF EVENTS

Physicians Welcome

March 3 - 8, 1952

Monday, March 3

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 - Physical Medicine Seminar; Synovitis in the Hand; Joseph Engel; 142 Chemical Engineering Bldg.

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

12:30 - Physiology Seminar; Kinetic Studies of Plant Metabolism Using Mass Spectrometer; Allan H. Brown; 214 Millard Hall.

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

4:00 - Pediatric Seminar; Studies on Blood of Children with Congenital Heart Disease; F. H. Adams; Sixth Floor West, U. H.

4:30 - 5:30 Dermatological Seminar; M-346, U. H.

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

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

Minneapolis General Hospital

7:30 - Fracture Grand Rounds; Dr. Zierold; Sta. A.

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

11:00 - Pediatric Rounds; Franklin H. Top; 7th Floor.

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

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

1:30 - Pediatric Rounds; Robert Ulstrom; 4th Floor.

Monday, March 3 (Cont.)

Veterans Administration Hospital

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

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

2:00 - Psychosomatic Rounds; Bldg. 5.

3:30 - Psychosomatic Rounds; C. K. Aldrich; Bldg. I.

Tuesday, March 4

Medical School and University Hospitals

8:30 - Conference on Diet Endocrines and Cancer; M. B. Visscher; 116 Millard Hall.

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.

12:00 - 1:30 Selected Topics, Permeability and Metabolism; Nathan Lifson; 129 Millard Hall.

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

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.

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

Ancker Hospital

8:00 - 9:00 Fracture Conference; Auditorium.

1:00 - 2:30 X-ray Surgery Conference; Auditorium.

Minneapolis General Hospital

8:00 - Pediatric Rounds; Spencer F. Brown; 5th Floor.

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

11:00 - Pediatric Rounds; Erling S. Platou; 7th Floor.

Veterans Administration Hospital

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

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

Tuesday, March 4 (Cont.)

Veterans Administration Hospital (Cont.)

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; Conference Room, Bldg. I.

1:00 - Surgery Chest Conference; T. Kinsella and Wm. Tucker; Conference Room, Bldg. I.

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

3:30 - 4:20 Autopsy Conference; E. T. Bell and Donald Gleason; Conference Room, Bldg. I.

Wednesday, March 5

Medical School and University Hospitals

8:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-109, U. H.

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

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

12:30 - 1:20 Radio-Isotope Seminar; 12 Owre Hall.

1:30 - Conference on Circulatory and Renal Systems Problems; M. B. Visscher; 116 Millard Hall.

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

5:00 - 6:00 Vascular Conference; Todd Amphitheater, U. H.

5:00 - 7:00 Dermatology Clinical Seminar; Dining Room, U. H.

7:00 - 8:00 Dermatology Journal Club; Dining Room, 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.

3:30 - 4:30 Journal Club; Surgery Office.

Wednesday, March 5 (Cont.)

Minneapolis General Hospital

8:00 - Pediatric Allergy Rounds; Lloyd Nelson; 4th Floor.

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

11:00 - Pediatric Rounds; Franklin H. Top; 7th Floor.

12:00 - Surgery Seminar; Dr. Zierold; Classroom.

12:30 - Pediatric Staff Meeting; Streptococcal Disease in Children; Floyd Denny; 4th Floor Annex.

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

1:30 - Pediatric Rounds; E. J. Huenekens and Robert Ulstrom; 4th Floor.

Veterans Administration Hospital

8:30 - 10:00 Orthopedic X-ray Conference; Conference Room, Bldg. I.

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

2:00 - 4:00 Infectious Disease Rounds; Bldg. I.

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

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

Thursday, March 6

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; Separation and Properties of Mitochondria; D. Ramras; 214 Millard Hall.

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

3:30 - Medicine-Pediatric Infectious Disease Conference; Heart Hospital Auditorium.

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.

Thursday, March 6 (Cont.)

Medical School and University Hospitals (Cont.)

5:00 - 6:00 X-ray Seminar; Pulmonary Fibrosis Following X-Ray Therapy for Carcinoma of the Breast; Leo Blank; 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.

Minneapolis General Hospital

8:00 - Pediatric Rounds; Spencer F. Brown; 5th Floor.

8:30 - Neurology Rounds; William Heilig; 4th Floor.

11:00 - Pediatric Rounds; Erling S. Platou; 7th Floor.

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

Veterans Administration Hospital

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

9:15 - Surgery Grand Rounds; Conference Room, Bldg. I.

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

Friday, March 7

Medical School and University Hospitals

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.

10:30 - 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; Subdural Hematomas in Infants; Martin E. Feferman, Lyle A. French, and William T. Peyton; Powell Hall Amphitheater.

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

2:00 - 3:00 Dermatology and Syphilology Conference; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312, U. H.

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

3:30 - 4:30 Advanced Neurophysiology Seminar; E. Gellhorn; 111 Owre Hall.

Friday, March 7 (Cont.)

Medical School and University Hospitals (Cont.)

4:00 - 5:00 Dermatology Seminar; W-321, U. H.

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

11:00 - Pediatric Rounds; Franklin H. Top; 7th Floor.

11:00 - Pediatric-Surgery Conference; Dr. Wyatt, Forrest Adams; Classroom, Sta. I.

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

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

1:30 - Pediatric Rounds; Robert Ulstrom; 4th Floor.

Veterans Administration Hospital

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

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

1:30 - Chest Conference; Wm. Tucker and J. A. Meyers; Ward 62, Day Room.

3:00 - Renal Pathology; E. T. Bell; Conference Room, Bldg. I.

Saturday, March 8

Medical School and University Hospitals

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

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

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

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.

11:30 - Anatomy Seminar; Tissue Mast-Cells; Dorothy Sundberg: Effects of Experimental Hypoxia and Hypothermia; N. A. Buchwald; 226 Institute of Anatomy.

Minneapolis General Hospital

8:00 - Pediatric Rounds; George Lund; 5th Floor.

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

11:00 - Pediatric Clinic; C. D. May and Floyd Denny; Classroom, 4th Floor.

Veterans Administration Hospital

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

8:30 - Hematology Rounds; P. Hagen and E. F. Englund.