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**Staff Meeting Bulletin
Hospitals of the » » »
University of Minnesota**



**Malignant Tumors
of Kidney**

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Published for the General Staff Meeting each week
during the school year, October to June, inclusive.

Financed by the Citizens Aid Society,
Alumni and Friends.

William A. O'Brien, M.D.

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
 CALENDAR OF EVENTS
 March 6 - March 11

Visitors Welcome

Monday, March 6

- 9:00 - 10:00 Roentgenology Medicine Conference; L. G. Rigler, C. J. Watson and Staff, Todd Amphitheater, U. H.
- 9:00 - 11:00 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff, Interns Quarters, U. H.
- 12:30 - 1:30 Pediatrics Seminar; Problem of Pertussis Immunity in the Young Infant; N. Beach; W-205 U.H.
- 12:30 - 1:30 Pathology Seminar; The Role of Hemolytic Streptococci in the Etiology of Rheumatic Fever; B. J. Clawson, 104 I.A.
- 4:00 - Preventive Medicine and Public Health Seminar; Problems of Public Health Nursing Distribution and Placement; Lily Hagerman, 116 M.H.
- 7:30 - Cancer Biology Seminar; Faculty Room, MeS.

Tuesday, March 7

- 8:00 - 9:00 Surgery Journal Club; O. H. Wangensteen and Staff, Main 515, U.H.
- 9:00 - 10:00 Roentgenology-Pediatrics Conference; L. G. Rigler, I. McQuarrie and Staff, Eustis Amphitheater, U.H.
- 11:00 - 12:00 Urology Conference; C. D. Creevy and Staff, Main 515, U.H.
- 12:30 - 1:30 Pathology Conference; Autopsies; Pathology Staff, 104 I.A.
- 12:30 - 1:30 Physiology-Pharmacology Seminar; Erythrocyte Permeability as Indicated by Isotope Studies; Nathan Lifson, 214 M.H.
- 4:30 - 5:30 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff, Station 54, U.H.
- 4:00 - 5:00 Pediatrics Grand Rounds; I. McQuarrie and Staff, W-205 U.H.
- 5:00 - 6:00 Roentgen Diagnosis Conference; H. S. Kaplan, C. L. Ould, M-515 U.H.

Wednesday, March 8

- 9:00 - 11:00 Neuropsychiatry Seminar; Please arrange with dept. for attendance at these exercises; J. C. McKinley and Staff, Station 60, Lounge, U.H.
- 10:30 - 12:00 Otolaryngology Case Studies: Out Patient Ear, Nose and Throat Department; L. R. Boies and Staff.
- 11:00 - 12:00 Pathology-Medicine-Surgery Conference; Carcinomatosis; E. T. Bell, C. J. Watson, O. H. Wangensteen and Staff, Todd Amphitheater, U.H.

12:30 - 1:30 Pharmacology Seminar; Chemical Resistance of *Endameba Histolytica* Cysts; A. Kuckler, 105 M.H.

4:30 - 5:30 Neurophysiology Seminar; Studies on Acetylcholine Metabolism; H. G. Wood, 129 M.H.

Thursday, March 9

9:00 - 10:00 Medicine Case Presentation; C. J. Watson and Staff, Todd Amphitheater U. H.

10:00 - 12:00 Medicine Rounds; C. J. Watson and Staff, East 214 U.H.

12:30 - 1:30 Physiological Chemistry Seminar; Oral and Dental Biochemistry; W. D. Armstrong, 116 M.H.

5:00 - 6:00 Roentgenology Seminar; Roentgen Diagnosis of Carcinoma of Fundus of Stomach, H. S. Kaplan, M-515 U.H.

Friday, March 10

9:00 - 10:00 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U.H.

8:30 - 10:00 Pediatrics Grand Rounds; I. McQuarrie and Staff

10:00 - 12:00 Medicine Ward Rounds; C. J. Watson and Staff; East 214 U.H.

11:45 - 1:15 University of Minnesota Hospitals General Staff Meeting; Epidemic Influenza; E. R. Rickard, Powell Hall Recreation Room

1:30 - 2:30 Medicine Case Presentation; C. J. Watson and Staff; Eustis Amphitheater.

1:00 - 2:30 Dermatology and Syphilology; Presentation of selected cases of the week; Henry E. Michelson and Staff; W-306 U.H.

1:30 - 3:00 Roentgenology-Neurosurgery Conference; H. O. Peterson, W. T. Peyton, and Staff, Todd Amphitheater, U.H.

Saturday, March 11

9:00 - 10:00 Medicine Case Presentation, C. J. Watson and Staff, Main 515 U.H.

9:15 - 11:30 Surgery-Roentgenology Conference; O. H. Wangensteen, L. C. Rigler and Staff, Todd Amphitheater, U. H.

10:00 - 12:00 Medicine Ward Rounds; C. J. Watson and Staff, E-214 U.H.

II. MALIGNANT TUMORS OF THE KIDNEY:

A review of 117 cases.

Louis C. Bixler, M.D.
K. Wilhelm Stenstrom, Ph.D.
C. D. Creevy, M.D.

From 1924 until 1940, inclusive, one hundred and seventeen cases of malignant renal neoplasms were seen at the University of Minnesota Hospitals. The follow-up period was carried on until the end of 1942. In this group there were 94 cases of carcinoma of the renal cortex, 13 cases of Wilms' tumor, 9 cases of carcinoma of the renal pelvis, and one sarcoma.

Historical

The first reported case of carcinoma of the renal pelvis was by Hedenius and Wandenstroem in 1878 in a 79-year old man.

Grawitz in 1882 first described the tumor which bears his name. He described a typical case under the name of "struma aberrata suprarenalis" and showed its resemblance to adrenal structure. Harris in the same year described a tumor of the kidney which he called "alveolar sarcoma of the renal capsule" which was similar to the adrenal.

Rokitansky in his textbook in 1861 gave what Newcomb states is a clear description of a Grawitz tumor. Later Birch-Hirschfeld introduced the term "hyper-nephroma".

At first most investigators accepted the Grawitz theory of the suprarenal origin of this tumor but in 1908 Stoerck brought forth his findings favoring the renal rather than the suprarenal origin. From that time on the controversy has raged and even to this day there is no unanimous agreement. However, at the present time the concensus seems to be definitely in favor of the renal origin.

The first accurate description of a mixed tumor of the kidney was apparently given by Eberth in 1872. Prior to that

time all malignant tumors of the kidney were thought to be carcinomas. Eberth believed these tumors came from inclusions of the Wolffian body because of the presence of embryonal muscle cells in the Wolffian body which he thought accounted for the presence of striated muscle fibers in the tumor. However, other investigators later showed these to be non-striated muscle fibers. Cohnheim in 1875 and Ribbert in 1886 attributed the origin of these tumors to aberrant germ plasm.

In 1894 Birch-Hirschfeld reviewed the literature and agreed with Eberth that the origin is in the Wolffian body. He suggested the term "adenomyosarcoma" for these mixed kidney tumors.

Wilms' wrote his classic monograph in 1894 in which he presented the theory of origin which is generally accepted today. He believed the anlage of the tumor was a fragment of primitive, undifferentiated mesodermal tissue of the type which gives rise to the myotome (source of striated muscle), the sclerotome (source of vertebral anlage), the nephrotome (Wolffian body anlage) and the mesenchymal tissue giving rise to smooth muscle.

Busse in 1899 disagreed with Birch-Hirschfeld by stating that remnants of the Wolffian body are not found in the kidney. He and Muus thought this tumor developed from a segregated portion of renal blastema which failed to develop normally.

Frazer in 1920 summarized the modern views of the origin of this tumor.

Hinman and Kutzmann suggested in 1924 that the simple tumors, the so-called sarcomata, can be explained by Birch-Hirschfeld's theory and the complex ones by Wilms' theory.

Geschickter and Weidenhorn in 1934 proposed the term "embryonal nephroma". They state the majority of these tumors are neither teratomatous nor mixed but represent neoplastic exaggeration of normal growth processes in the growth

zones of the renal cortex in late fetal life and the first few months of infancy.

The first successful removal of a Wilms' tumor was by Jessop of England in 1877 on a 2 1/2 year old boy who died nine months later of a recurrence. Israel reported the first surgical cure in 1894 on a 14-year old boy on whom he had operated in 1888.

Heimann in 1915 reported the first use of post-operative X-ray therapy on a Wilms' tumor. A nephrectomy was performed in July 1913 and X-ray therapy started in August. The patient received eight treatments but died three months later from metastases.

Friedlaender in 1916 reported one of the first cases in which X-ray therapy was used as a primary treatment. The tumor decreases markedly in size but at autopsy, a few months later, metastases were found in the lungs and liver.

The first planned pre-operative X-ray therapy was apparently reported by Geraghty in 1923. It was intended to be pre-operative treatment to reduce the size of the tumor mass, but after X-ray therapy the patient disappeared and did not return for nephrectomy. He was later found to have expired 5 1/2 years after the X-ray therapy.

For a more complete survey of the history of these tumors, the reader is referred to the articles by Gilbert²⁹ and Kretschmer³⁰.

Classification.

The classification of renal tumors which we have used is as follows:

- | | |
|---|--------------|
| I. Renal Tumors in Children | |
| A. Benign | B. Malignant |
| Multiple tumors
with tuberosesclerosis | Wilms' tumor |

II. Renal Tumors in Adults

- | | |
|----------------|--------------------------------------|
| 1. Parenchymal | |
| A. Benign | B. Malignant |
| a. Fibroma | a. Liposarcoma |
| b. Leiomyoma | b. Fibrosarcoma |
| c. Lipoma | c. Adenocarcinoma
(hypernephroma) |
| d. Hemangioma | d. Wilms' tumor |
| e. Adenoma | |
-
- | | |
|-----------|--------------|
| 2. Pelvis | |
| A. Benign | B. Malignant |
| Papilloma | Carcinoma |

This classification was presented in a previous publication by Bell¹.

Adenocarcinoma of the Kidney Cortex (Hypernephroma).

Adenocarcinoma of the kidney cortex is by far the largest group in this series of malignant renal neoplasms, comprising 94, or 80%, of the 117 cases.

We regard adenocarcinoma of the renal cortex the same as hypernephroma. The disagreement which formerly existed regarding this neoplasm seems to be disappearing and there is now a fairly general acceptance of its renal rather than suprarenal origin. (2, 3, 8, 9, 14, 16).

Of the 94 cases of carcinoma of the cortex, 81 were proved by histological examinations. The remaining 13 were diagnosed by clinical symptoms, urography and gross appearance of the tumor at operation in which, for some reason, nephrectomy or biopsy were not done.

This malignancy occurs almost entirely after the age of forty. In this series 94% of the patients were 40 years of age

or older, and only 6% were less than forty. Neff²³ reported 18 cases all of which were past forty. MacKenzie and Parkins⁷ found 84% after 40 and Smith and Young²² 80% after forty. In a series of cases published by Judd and Hand¹⁴ the average age of onset of symptoms was 51 years. The average age of the patients in our series at their first hospital visit was 53.4 years. The youngest was 18 and the oldest 76. Incidentally, the 18-year old patient is alive and well and dismissed from follow-up eleven years after nephrectomy and X-ray therapy.

Table 1 shows the age distribution of this series.

Males were affected more frequently than females, there being 59 men (63%) and 35 women (37%). In most of the other reported series, the relative frequency in men has been even higher. Belchor⁶ and Priestley¹⁶ reported 70% males, Hyman² 74%, Judd and Hand 68% and Neff 91%.

Table 2 shows the sex distribution in this series.

The symptoms of which the patients complained varied considerably, but there were some which were found consistently enough to be of significance. Hematuria, pain, abdominal mass, weight loss and weakness were most common. Hematuria, as either an initial or associated symptom, was present in 64 of the 94 cases. Pain was present in 58 cases, abdominal mass in 33, weight loss in 19 and weakness in 13. Varicocele is frequently mentioned as a symptom, but in our series it was encountered only once.

Table 3 shows the frequency of these as initial and associated symptoms along with the frequency in several other reported series. By initial symptom, we mean single initial symptom not associated with other symptoms until possibly later. If two or more symptoms appeared simultaneously, they have been listed as associated symptoms.

Hematuria was the initial symptom in 21 (22%) of the cases and an associated symptom in 43 (45%) of the cases, making

a total of 67% with hematuria. Belchor reported hematuria in 53%, Judd and Hand in 63%, MacKenzie and Parkins in 62%, Hyman in 80% and Smith and Young in 64%.

Hematuria may be an early or a late symptom. It may be early clinically and late pathologically. It occurs when there has been an invasion of the renal pelvis or calyces, or as Ljunggren³⁸ has pointed out, when there is venous stasis of the mucosa of the renal pelvis. Patients have presented themselves at the University Hospitals within two weeks after the first episode of hematuria only to find the tumor inoperable or metastases already present. There is not infrequently an interval, which may be as much as several months, between bouts of hematuria during which the urine is normal, at least microscopically. This quiescent period may be very dangerous for, by giving the patient and even the physician a false feeling of security, the opportunity of making an early diagnosis may be lost. Obviously, every case of hematuria deserves a complete examination including urography. Several of our patients have had a history of intermittent hematuria for several years. It is difficult to establish whether the malignancy was present during all those years, or whether there was another basis for the hematuria. Certainly some malignant tumors of the renal cortex can be quite slow growing. Carlson and Ockerblad³⁴ report a case in which an X-ray and clinical diagnosis of carcinoma of the cortex was made. The patient refused surgery. Ten years later the patient was again seen and the tumor was found to be somewhat larger. This time a nephrectomy was done and the tumor shown to be a carcinoma of the cortex. Apparently the malignancy was present for all those years and yet was operable. This, of course, is an exception to the course these tumors ordinarily take.

However, even though hematuria may frequently be a late symptom, it nevertheless seems that it is the symptom most likely to bring the patient to the physician in time to make possible an

Table I

Age Distribution of 94 Cases of Carcinoma of the Renal Cortex.

Age	Proved cases	Unproved cases	Total	
			No.	Percent
10-20	1	0	1	1
20-30	3	0	3	3
30-40	2	0	2	2
40-50	22	6	28	30
50-60	22	4	26	27
60-70	30	3	33	35
70-80	1	1	2	2

Table II

Sex Distribution of 94 Cases of Carcinoma of the Renal Cortex

Sex	Proved cases	Unproved cases	Total	
			No.	Percent
Males	48	11	59	63
Females	32	3	35	37

early diagnosis. When symptoms such as weight loss, weakness, pain and mass bring the patient, it is almost surely an advanced case.

Next to hematuria, pain was the most common complaint, occurring in 58 (62%) of the 94 cases. Pain has been a frequent symptom in most of the reported series, being present as much as 83% in one series (Judd and Hand). It was most frequently located in the back and almost always in the lumbar region. Thirty one patients complained of backache. Pain was present in the abdomen in 18 cases and in the flank in six. There were only 3 cases in which it was typical of renal colic, and in one of these renal stones were present along with the malignancy.

It is difficult to evaluate the significance of backache in these patients. Most of them are in the age group where some degree of backache is not unusual and in those cases in which it was present for several years the connection with the malignancy might well be ques-

Table III

Symptoms presented by 96 cases of Carcinoma of the Renal Cortex, compared with other reported series -

	Author's Series		MacKenzie Smith & Judd & Parkins Young & Hand		Hyman	Belchor	Neff	Chute
	No.	Percent	Percent	Percent	Percent	Percent	Perc.	Perc.
Hematuria					68	60	36	88
Initial	21	22	38	48			35	
Associated	43	46	24	16	-	-	18	-
Pain:					83	30	28	60
Initial	16	17	43	34				
Associated	42	45	30	36	-	-	-	-
Weight Loss:								
Initial	7	8						
Associated	12	13						
Mass:					78	80	12	62
Initial	11	12	8	9			5	
Associated	22	24	54	29	-	-	42	-
Weakness:								
Initial	5	5	5	6				
Associated	8	9	18	17				

tioned. Two patients complaining of backache for seven and five years, respectively, were both alive and well at the close of the study, the first for a period of 7 years and the second for 5 years. The patient complaining of backache for 5 years also complained of hematuria for the same length of time, and in this case it seems reasonable that the backache was related to the malignancy for this period. The other patient had no complaints other than the backache until 1-1/2 years before coming to the University Hospitals at which time she had her first attack of hematuria. The connection of the backache to the malignancy for the 5 1/2 years during which time she had no other complaints might well be questioned.

An abdominal mass was present in 33 (36%) of the 94 cases. Many of the patients were not aware of the actual presence of a mass but only experienced a feeling of fullness and abdominal discomfort.

The classical triad of symptoms of carcinoma of the kidney cortex: namely, hematuria, pain and abdominal mass, was present in only 10 cases which is somewhat lower than in some of the other reported series. Belchor found 25% presenting this triad and Chute found 31%.

Nineteen cases complained of weakness and weight loss and in 7 of these it was the initial symptom. It is interesting to note that 5 of these 7 cases lived less than six months after first being seen at the University Hospitals.

Occasionally, there are cases in which none of the symptoms are associated with the urinary tract and in these cases much valuable time may be lost until attention is finally focused on the urinary tract. Fifteen of our cases complained only of weakness, weight loss, epigastric distress, cough (from lung metastases), backache or a combination of these symptoms and the true nature of the lesion was not apparent until after some study. In some cases, metastases to the lungs or bone may be the first indication of the presence of the lesion. Rolnick²⁶ found 14

out of a series of 54 cases in which none of the symptoms were referable to the urinary tract.

Metastases were demonstrated at the time of diagnosis in 15 of the 81 proved cases of carcinoma of the cortex. The site of metastasis was the bones in 7 cases, the lungs in 6, and the liver in 3. Late metastases are known to have developed in 28 of the 81 cases, the bones being the site of involvement in 13 cases, the lungs in 11 and the liver in 5. The frequency of bone metastases in this lesion has been noted by Ewing⁴³ and others.

There is some question as to the advisability of nephrectomy in the face of known metastases at the time of diagnosis. In our series, nephrectomy was performed only 4 times in the presence of known metastases. One of these cases lived slightly more than one year and the other 3 lived less than one year. Hyman is of the opinion that pulmonary or bone metastases not producing marked systemic effects and in the absence of cachexia do not contraindicate nephrectomy. Ljunggren⁴⁴ is of this same opinion and cites a case in which a single pulmonary metastasis was followed after nephrectomy for 3 years with only slight increase in size. On the other hand, Braasch and Griffin believe nephrectomy is contraindicated in the presence of pulmonary metastases, and cite the fact that all 6 of their cases in this category lived less than one year (5). Waters³⁷ also feels that the presence of metastases is a contraindication to nephrectomy. However, it is our opinion that a single, small metastatic lesion in one lung or in bone should not contraindicate nephrectomy. Such patients may have a considerable life expectancy.

Attempts frequently have been made to correlate the size of the tumor with the prognosis. It is well known that patients have survived for many years following the removal of a large kidney tumor with no evidences of metastases at the time of surgery nor of the development of late metastases. It is also well known that very small tumors, even as

small as 1-1/2 cm. may metastasize early. Obviously, no hard and fast rule can be laid down correlating the size of the tumor with the prognosis. But in general, it seems the prognosis is poorer with the larger tumors and that was true in our series, although the difference was not so marked as in some of the other series. In the cases in which the tumor was less than 5 cm. in diameter or weighed less than 500 gms. the 5-year survival was 50%, whereas in the group in which the tumor was 10 cm. or more in diameter or weighed 1000 gms. or more, the 5-year survival was 38%. In his series, Priestley¹⁶ reported a 46% 5-year survival in the group in which the tumor weighed less than 500 gms., whereas in the group in which it weighed more than 1000 gms. the 5-year survival was only 24%. Bell has made the observation that metastasis is much less common in tumors less than 5 cm. in diameter than in those having a larger diameter. Out of a group of 149 autopsy cases which he reported, only 5 of the 65 cases in which the tumor was less than 5 cm. in diameter showed metastases, whereas in the group in which the tumor was larger than 5 cm. in diameter, 66 of 84 cases had metastases. It is interesting to note that in our series, in the group in which the tumor was small, 20% expired in one year or less after first being seen at the Hospital, while in the group in which the tumor was large, 42% expired in one year or less. Braasch and Griffin believe that the fixation of the tumor is of greater prognostic import than the size.

Many authors have attempted to establish a correlation between the architectural pattern of the carcinoma and its degree of malignancy, classifying them as alveolar, tubular, cordon, adenomatous, papillary, etc. However, as Bothe³⁰, Portmann³⁵, Hunat and Hager⁸, Bell¹ and others have pointed out, two and even several of these patterns may exist in the same lesion. It would seem, therefore, that any classification or estimation of malignancy based upon the cellular arrangement of the lesion is very likely to be unsatisfactory. This procedure may have some advantage but we have not used it.

We believe that irradiation of metastases and recurrences is definitely worthwhile. Whether or not life is actually prolonged is a debatable question and one difficult to prove. However, there can be no doubt as to its value in palliation; the relief of pain and the return to a fairly normal life, even though temporary, make it a justifiable procedure. We have seen patients who have had almost constant pain and have been incapacitated by metastases who, after a series of X-ray treatments to the metastatic lesions, were completely relieved of their pain, and were able to carry on a fairly normal life for many months and in some cases even for years. In this series, 25 cases received X-ray therapy to metastases or recurrences. Of this group, 9 lived one year or more following the course of X-ray therapy to the metastases and 16 lived less than one year. Of the 9 cases which lived one year or more, one is still living 17 months after irradiation of metastases to the lungs and one expired 2 years and 3 months after irradiation of metastases to the lungs. Two cases expired 3-1/2 years after therapy to bone metastases. One case expired 4 years after therapy to cervical gland metastases. Dean¹⁸ is of the opinion that pulmonary metastases may be radio-sensitive but does not believe that bone metastases are. Koenig and Culver⁴, however, feel that metastases to bone are frequently radio-sensitive. In our few cases bone metastases have responded fully as well as the pulmonary metastases and the relief of pain, which so frequently accompanies metastases to bone, is usually gratifying.

The value of X-ray therapy in carcinoma of the renal cortex, except as palliation, is a controversial subject. It seems to be agreed that irradiation alone is not enough to control the disease and is only palliative (3, 18, 19, 21). Most authors feel that irradiation in conjunction with nephrectomy offers the best hope of cure. Munger¹⁹ feels that pre-operative X-ray is useful but warns that surgery should not be delayed following the completion of the treatments, never more than 14 days in his series.

Waters and Lewis²⁰, Kerr⁴⁵ and Dean also recommend pre-operative irradiation. Dean suggests that pre-operative X-ray therapy may partially prevent the dissemination of tumor cells at the time of operation and this opinion is supported by Munger. The administration of pre-operative irradiation may, by reducing the size of the tumor, greatly facilitate nephrectomy. One of our patients was operated in March 1938 at which time a nephrectomy was contemplated. However, because of the size of the tumor and its adherence to surrounding structures, it was considered inoperable and nephrectomy was not done. The patient was referred to the X-ray Department for X-ray therapy and received 1450 tissue r to each of 3 fields in 25 days. In July, 6 weeks after completion of the course of X-ray treatments, the patient was again operated and this time a nephrectomy was successfully done. A course of post-operative irradiation of 1450 tissue r to each 3 fields was given and when last heard from in August 1943 the patient was alive and well with no evidence of disease. (5 years)

The value of post-operative irradiation is not established. Hyman and Kerr do not believe it is of any value. Braasch and Griffin state that it has not been shown to be of much value in their experience. Portmann, however, recommends that post-operative irradiation be used routinely. He feels that cells which might have been left behind following nephrectomy might be rendered dormant and less liable to cause metastases. Dean does not agree with this and states that if the tumor is not entirely removed, X-ray may slow but will not prevent a recurrence of the tumor. Bothe³⁶ formerly favored irradiation and recommended that it be used in all malignant kidney tumors. But in a recent article (21) he reversed his former opinion and now feels that X-ray therapy does not enhance the prognosis but is only palliative. It seems that to date nobody has proven by statistical studies that post-operative irradiation leads to additional cures, but it does not seem improbable. Undoubtedly it delays the growth of possibly remaining cancer cells and for that reason we have considered it a worthwhile procedure in certain cases.

Rigler⁴⁶ is of the opinion that urography is of considerable value in the diagnosis of renal tumors. In those cases in which attention is first directed to a metastatic lesion, or in which the symptoms are vague and not particularly suggestive of disease in the urinary tract, excretory urography may be very helpful in determining if a kidney is the site of the primary lesion. If the symptoms are referable to the urinary tract, excretory urography is helpful in determining the side involved. If this examination is negative or inconclusive, a retrograde pyelogram should be made.

Treatment of Carcinoma of the Renal Cortex

The treatment in this series of carcinoma of the renal cortex consisted of nephrectomy, nephrectomy plus irradiation and irradiation alone. Whereas, in obtaining the figures which were presented in connection with the clinical picture, both the 81 proved cases and the 13 unproved cases were used; in compiling the survival figures and results of treatment only the proved cases were considered.

It is not within the scope of this paper to present or discuss the details of the surgical treatment. The results obtained in the cases in which surgery was used, either alone or in conjunction with irradiation, will be presented later.

The radiation therapy in this series was administered by a mechanically rectified unit, operating at 200 KVP and 30 MA with 1 mm. of copper and 1 mm. of aluminum filter. The half value layer was 1.4 mm copper. At the present time we are using 400 KVP and a half value layer of 4 mm. of copper for the treatment of kidney tumors, but the machine permitting these factors was not available when the patients in this series were treated. Irradiation to the kidney area was usually administered through one anterior, one lateral and one posterior field. The size of the fields varied with the size of the lesion and amount of extension into adjacent struc-

tures. A target-skin distance of 70 cm. was used for the anterior and posterior fields and 60 cm. for the lateral field. In the average case, one field was treated daily, the average daily dose being 250 r in air. The total amount given varied considerably. The largest amount given in one continuous series was 3800 tissue r to the tumor in 4 weeks. This patient was given 2300 r in air to each of the 3 fields. Several of the cases received over 3000 tissue r to the tumor, but the average dose amounted to about 2200 to 2500 tissue r to the tumor in the cases in which the series of treatments was completed. Six of the patients who were started on a series of treatments to the kidney area did not finish the series and failed to receive the amount of irradiation which was planned for them.

Impiombato¹³ states that the kidneys are among the least sensitive of all the organs and that a dose of 2000 r has practically no effect on the kidney. Thus it would appear safe to give a considerably larger dose than this to the tumor without damaging the normal kidney tissue. Dean³ gives "a single portal 250 r daily until each of 3 fields has received 2500 r". Waters³⁷ recommends "daily doses of 250 r" to each of an anterior, lateral and posterior field and in his cases the tumor dose varied from "1100 r, the smallest, to 3500 r, the largest". Munger gives multiple ports 300 r in air per day in rotation until "2100 to 3000 r per skin area" have been given.

It is advisable to observe these patients closely during the treatments. Blood counts should be checked every few days and if there is any appreciable drop, therapy should be discontinued temporarily. A total white blood count of 3000 has been adopted arbitrarily as the low level at which therapy will be given, and if it drops below this level, therapy is stopped until the count increases again. It is well to watch the lymphocyte count as well as the total white count. A drop in the lymphocytes is also a danger signal and frequently occurs before the total white count starts to drop. Occasionally the

total white count or the lymphocyte count decreases slowly and in this case it may be safe to continue treatment cautiously, but if the drop is rapid, treatment should be stopped completely until the count starts back up again. In this event transfusions are of great value.

The temperature should also be checked and if the patient develops an appreciable fever, it is usually advisable to decrease, or even stop, the treatments until it subsides somewhat. It usually indicates a rapid destruction and absorption of tissue as well as infection. In the presence of infection, large doses of X-ray may be actually harmful to the patient.

Radiation sickness is occasionally troublesome. Our patients are urged to drink large quantities of fluids and to lie down and rest soon after the treatment. Sedation may help to alleviate the sickness. Care of the bowels is also an important factor, and patients are instructed in the type of diet which will aid in elimination and are advised to take enemas when necessary. Vitamin B₁ is often given and seems to be of value in many cases.

Results of Treatment of Carcinoma of the Kidney Cortex

As was stated before, treatment consisted of surgery alone (17 cases), surgery plus irradiation (48 cases) and irradiation alone (13 cases). Three cases received no treatment.

Seventeen cases of proved carcinoma of the renal cortex were treated by nephrectomy only. It should be mentioned here that this represents a rather selected group as all of the patients were regarded as good surgical risks without known metastases at the time of diagnosis (with one exception) and it was felt the entire tumor had been removed at surgery. If there was any doubt as to these conditions, the patient was referred for X-ray therapy. Of course, in some of the patients referred for radiation therapy, there were no known metastases

present and it was felt that the entire tumor had been removed at surgery.

Of the 8 cases treated by nephrectomy only up to the end of 1937, 4 lived five years or more. One case treated in 1935 lived 7 years and expired in 1942. The other three are living and well at the present time, one for 10 years and the other two for 7 years.

Of the 9 cases treated by nephrectomy only since 1937, 3 are living and well at the present time and one was living and well when last heard from in 1941. One of these cases was treated in 1938 and has actually survived 5 years, being alive and well in 1943. The other 2 cases were treated in 1940 and are both living and well in 1943. The results of treatment in this group are shown in Table 4.

Forty eight cases of proved carcinoma of the renal cortex were treated by nephrectomy and irradiation. Thirty six were treated up to and including 1937. Of these 11 (30%) survived 5 years or more, and 8 are living and well at the present time, 3 of them for 10 years or more.

Metastases were present at the time of diagnosis in 3 of these 36 cases and all were dead in one year or less.

Four of these 36 cases, treated up to the end of 1937, received no irradiation to the kidney area but did receive irradiation to metastases later. One of these lived for 17 years from the time of surgery, one lived for 2 years and the other two expired in less than one year. Twenty four of the 36 cases treated by both nephrectomy and irradiation up to the end of 1937 received immediate post-operative prophylactic X-ray therapy. By that we mean (1) the X-ray therapy was given as soon after the nephrectomy as possible, in most cases within one month; (2) no known metastases were present at the time treatment was initiated; (3) the full course of therapy as planned was administered. Of these 24 cases, 10 (42%) survived 5 years or more after the treatments.

The results of treatment in this group of 24 cases receiving immediate postoperative prophylactic X-ray therapy are shown in Table 7.

Twelve proved cases of carcinoma of the renal cortex have been treated since 1937, of which 7 are known to be dead, one last heard from in 1941 had metastases to the lungs, one last heard from in 1942 had metastases to the spine, and 3 are living and well in 1943. It is probable that the survival rate for this group treated since 1937 will not equal the rate for the patients treated prior to that year, and it is possible that the survival rate of 42% is higher than will be obtained over a longer period with a larger group of patients. The results in the whole group of adenocarcinoma of the renal cortex treated by nephrectomy and irradiation are shown in Table 5.

Thirteen proved cases of carcinoma of the renal cortex were treated by irradiation alone. Ten of this group had metastases at the time of diagnosis and all are dead. One case lived 4 years after therapy, 2 lived one year and 7 expired less than one year after therapy. Three of these 13 cases did not have metastases at the time of diagnosis. One of these 3 was explored and the tumor found inoperable. Another was considered a poor surgical risk and surgery was not done. Both of these cases were dead in less than one year. The third case was explored and an abscess found in the kidney area which was drained and a large amount of necrotic material removed. The patient was given post-operative X-ray therapy in December 1937, about two months after surgery. This patient was alive and well with no evidence of disease in August 1943. Table 6 shows the results obtained in this group treated by irradiation only. Of all the patients who came to the Clinic before the end of 1937, 58 cases, 17 have survived 5 years or more, an absolute 5-year survival rate of 29%.

TABLE IV

17 Cases of Proved Carcinoma of the Renal Cortex Treated By Nephrectomy Only.

Year	No. of Cases	Years Survival										Living	
		1	2	3	4	5	6	7	8	9	10		
1930	1	0	0	0	0	0	0	0	0	0	0	0	0
1931	1	1	1	1	1	1	1	1	1	1	1	1	1 (Jul. 1941)
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	4	3	3	3	3	3	3	3					2 Apr. 1942 and Jul. 1943. (one expired Nov. 1942)
1936	1	1	0	0	0	0	0						0
1937	1	1	1	1	1								0
1938	3	3	3	3	2								3 Oct. 1941 and 2 in Jul. 1943
1939	2 (1)	0	0	0									0
1940	4	3	2										2 July 1943.

(figures in parenthesis indicate presence of metastases at time of diagnosis)

Cases	17	17	17	13	11	8	7	6	2	2	2		
Survival		12	10	8	7	4	4	4	1	1	1		

TABLE V.

48 Cases of Proved Carcinoma of the Renal Cortex Treated by X-ray and Nephrectomy

Year	No. of Cases	Years Survival										Living	
		1	2	3	4	5	6	7	8	9	10		
1924	1 (*)	1	1	1	1	1	1	1	1	1	1	1	0 Expired Apr. 1941
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	1 (*)	1	1	0	0	0	0	0	0	0	0	0	0
1927	1 (*)	0	0	0	0	0	0	0	0	0	0	0	0
1928	3	2	1	1	1	1	1	1	1	1	1	1	1 (Dismissed from follow-up)
1929	2	2	2	2	1	1	1	1	1	1	1	1	1 " " "
1930	1 (1)	0	0	0	0	0	0	0	0	0	0	0	0
1931	1	0	0	0	0	0	0	0	0	0	0	0	0
1932	1	1	1	1	1	0	0	0	0	0	0	0	0
1933	3	3	3	1	1	1	1	1	1	1	1		1 August 1943
1934	5 (1)	4	3	3	3	3	1	1	1				1 July 1943
1935	2	2	1	0	0	0	0	0					0
1936	7	6	5	4	3	3	3						3 Nov. '42 and 2 in Aug. '43.
1937	8 (1*)	7	4	3	1	1							1 Nov. 1942
1938	5	4	3	3	3								2 Aug. 1943
1939	3	3	2	1									1 Jan. 1943
1940	4	2	1										1 July 1942 with metas. to the spine.

Cases	48	48	48	44	41	36	28	21	19	14	11		
Living		38	27	19	15	11	8	5	5	4	3		
% Living		79	56	43	37	31	29	24	26	29	27		

Number in parenthesis indicates metastases at the time of diagnosis
 Asterisk in parenthesis indicates a case in which no X-ray therapy was given to the kidney but was given to metastases later.

TABLE VI

13 Cases of Proved Carcinoma of the Renal Cortex
Treated by Irradiation Only

Year	No. of Cases	1	2	3	4	5	Living
1926	1 (1)	0	0	0	0	0	0
1928	1 (1)	1	1	1	1	0	0
1929	1 (1)	0	0	0	0	0	0
1932	1 (1)	0	0	0	0	0	0
1934	5 (5)	2	0	0	0	0	0
1937	2 (1)	1	1	1	1	1	1 August 1943
1939	2	0	0	0			0
Cases	13	13	13	13	11	11	
Survival		4	2	2	2	1	

(Number in parenthesis denotes metastases at time of diagnosis.)

TABLE VII

Results Obtained in 34 Cases of Carcinoma of the Renal Cortex
Treated by Nephrectomy and Immediate Post-Operative
Prophylactic X-ray Therapy

Year	No. of Cases	1	2	3	4	5	6	7	8	9	10	Living
1928	3	2	1	1	1	1	1	1	1	1	1	1 (Dismissed from follow-up)
1929	2	2	2	2	2	1	1	1	1	1	1	1 " " "
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	1	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0
1933	3	3	3	2	1	1	1	1	1	1		1 July 1943
1934	4	4	3	3	3	3	1	1	1			1 " "
1935	1	1	1	0	0	0	0	0				0
1936	6	6	5	3	3	3	3					3 Nov. 1942 and 2 in Aug. 1943
1937	4	4	3	3	2	1						1 Nov. 1942
1938	4	3	3	3	3							2 Aug. 1943 (1 Exp. Dec. 1942)
1939	2	2	1	1								1 Jan. 1943
1940	4	3	2									1 July 1942 with metas. to spine
Cases	34	34	34	30	28	24	20	14	13	9	6	
Survival		30	24	18	15	10	7	4	4	3	2	
Percent		88	71	60	55	42	35	29	31	33	33	

Wilms' Tumor (Embryonal Adenomyosarcoma)

Thirteen cases of Wilms' tumor were seen at the University Hospitals from 1926 to 1940, inclusive. Five cases were proved by histological examination and 8 were diagnosed by typical clinical findings, urography, appearance at laparotomy and response to irradiation. All cases were followed to the close of the study in 1942, and 2 of the 3 living cases were seen in June and July of 1943.

There were 9 males and 4 females in this series. In most of the reported series males predominate over females although in some series the opposite is true. (The difference does not seem to be of any diagnostic significance). Twelve of the 13 cases were 6 years of age, or less. The youngest was 3 months and the oldest 11 years. This is essentially a disease of infants and young children although cases have been reported in late adult life. Deming⁴¹ is credited with having treated the youngest patient with this lesion, a nephrectomy in a 29-day old infant. MacKenzie and Parkins reported a series of 11 cases all under 7 years of age and in Kerr's series (15) all were under 6 years of age.

Abdominal mass, hematuria and pain were the most common symptoms.

Abdominal mass was present in 9 of the 13 cases (69%), being the initial symptom in 5 cases and an associated symptom in four. It was usually present only a few weeks until the patient was seen at the Hospital, but in 2 cases the mass was present for more than a year. In one case, a 6-year old female (Case 8) the mass had been present for 1-1/2 years before the patient was first seen at the Clinic. She expired 14 months after laparotomy and X-ray therapy with metastases to both lungs. The other case was a 1-1/2 year old female (Case 1) in whom the mass had been present for 1-1/4 years when first seen. She expired three months after nephrectomy and X-ray therapy with metastases to both lungs. Abdominal mass is almost always present. Kretschmer³⁰ reported a series of 24 cases in which it was present in all. Kerr states that it is usually present.

Hematuria was present in 4 of the 13 cases (30%), being the initial symptom in one and an associated symptom in three. This is somewhat more frequent than hematuria is usually seen. It was present in only one of Kretschmer's 24 cases and in only one of Neff's 8 cases. Kerr states that it occurs in from 10% to 25% of the cases. Pain was present in 4 cases and weight loss in two. In Kretschmer's series, pain was present in 33% and weight loss in 25%.

In one case (case 12) fever was the initial symptom and had been present for only two weeks when the patient was first seen at the Hospital. A palpable mass was found 5 days previously. Irradiation to the kidney area was given, but in spite of the early therapy after appearance of symptoms, the patient expired two months later with metastases to both lungs. Known metastases were present at the time of diagnosis in 5 cases and in each instance the site of metastasis was the lungs. Late metastases occurred in 3 cases and here, too, the site in each instance was the lungs.

One case presents some very interesting features. A 2-year old girl (case 13) was admitted to the Hospital in April 1940 with the complaints of abdominal mass, abdominal pain and hematuria of 4 months' duration. The patient was treated by X-ray only. From April 16th to 27th she was given 650 tissue r to each the anterior and posterior right kidney area. From June 5th to 25th the anterior, lateral and posterior right kidney areas were each given 1250 tissue r. On August 1st an X-ray of the chest revealed metastases to the apex of the left lung and so from August 7th to 22nd 1550 tissue r were administered to each the anterior, lateral and posterior left upper chest. Another course of therapy was given to the 3 kidney areas from August 23rd to September 14th, 1300 tissue r being given to each field. A re-examination of the chest in February 1941 revealed metastases to the right lower lung field and accordingly 1300 tissue r were given to each the anterior, lateral and posterior right lower chest. Repeated X-ray examinations since that time show that the metastases in both of

these areas have disappeared following therapy. This patient was alive and well with no evidence of recurrence in July 1943.

Kerr reported a case with pulmonary metastases which disappeared following X-ray therapy. Kretschmer also reported a case with pulmonary metastases which disappeared following X-ray therapy in which, however, at autopsy many metastases were found throughout both lung fields (31). It seems that radiation therapy to metastases may be of considerable value, and Kerr, Dean, Bothe and others recommend its use.

Table 8 gives a brief outline of these 13 cases. It will be seen that 9 of the cases expired within 14 months after therapy and one expired 4 years after laparotomy and X-ray therapy. Three of the 13 cases are living and well, one for 2 years, one for 3 years in July 1943, and one for 4 years and 8 months in June 1943. These 3 cases were all treated by a different method, the first receiving nephrectomy and post-operative X-ray therapy, the second X-ray therapy only, and the third pre- and post-operative X-ray and nephrectomy.

It seems to be rather generally agreed that X-ray therapy is more useful in the treatment of Wilms' tumor than in any other malignant renal neoplasm. Dean states that in his few personal cases X-ray alone has given as good or better results than X-ray plus surgery. He feels that surgery alone is practically of no benefit. Pohle and Ritchie⁴² reported a case living 3 years and 8 months after X-ray therapy only, and McNeil and Chilko²⁸ reported one living and well 3 years after X-ray therapy only. Opposed to this view are Mixer²⁸, Wade⁴⁰ and Ladd and White⁴⁷ who believe that early nephrectomy offers the only hope of cure. Ladd and White reviewed the literature and added a series of 60 cases of their own with results strongly favoring surgery in the treatment of this tumor. In their group of 60 cases they had 8 5-year survivals and 6 other cases still living 2 to 4 years after therapy, and in this group of 14 cases, only 1 had received X-ray therapy. They did not state how many of the entire

group of 60 cases had received X-ray therapy. Nephrectomy was done on all 14 cases.

Some authors prefer to use pre-operative X-ray therapy and nephrectomy, (15, 32, 33). The marked reduction in size which invariably follows irradiation to this tumor greatly facilitates nephrectomy. Others (3, 16, 30) follow this with post-operative X-ray therapy. We are of the opinion that pre- and post-operative irradiation ought to be used, but statistical proof of its value is so far lacking. However, the results seem to be poor regardless of the type of therapy used.

The radiation therapy in this group was administered with the same equipment as was used for the tumors of the cortex. Treatment was administered to an anterior and posterior field and in some of the cases a lateral field was added. The usual daily dose was 200 r/air to one field. The amount varied somewhat but in general was about 1500 tissue r per field and in several of the cases the course of therapy was repeated. In the average case this delivered between 2500 and 3000 tissue r to the tumor. Nephrectomy was performed on 4 of these cases and 3 of them received pre- and post-operative X-ray therapy. Two expired in less than one year and one is living and well in June 1943, 4 years and 8 months after therapy. One patient upon whom nephrectomy was done received only post-operative X-ray therapy and is living and well in October 1942, 2 years after therapy. Kerr, in the treatment of this lesion, gives 200 r/air per day to one of 3 ports until 3000 - 4000 r/air have been delivered to each port. (Dean³ states that if X-ray alone is to be used, "daily treatments of 75 r to 100 r should be given to one of 3 ports until 3000 r has been applied to each." If therapy is to be pre-operative, with the intention of decreasing the size of the tumor, he states "200 r can be given to a single portal (of 3 to be used) daily". After two cycles, if the radiation is well tolerated the daily dose can be reduced to 100 r. After nephrectomy has been performed, "100 r is given a portal daily until

2000 r has been received by each of 3 portals". In the average child, this gives about 7 T.E.D. to the pedicle of the tumor. The prognosis in this lesion is very poor.) MacKenzie³⁹ places the mortality at 98%, while Hyman, Kerr and McNeil and Chilko all place it at above 90%. Bothe reported a series of 7 cases all dead within 3-1/2 years. Mixer³⁷, however, believes the outlook after 2-years' cure is better with Wilms' tumor than with any other malignant renal neoplasms.

Eight of these 13 cases have not been proven histologically but the symptoms were so characteristic, as well as the gross appearance of two at laparotomy and the response to irradiation, that the diagnosis can hardly be doubted.

The following shows the results of treatment in Wilms' tumor in some of the reported series:

1. Kretschmer: 7 cases, 5 dead in 1-1/2 yrs. or less, 2 living 2-1/2 and 3-1/2 years.
2. Mixer: 26 of 27 cases dead in less than 18 months.
3. Wollstein: 4 of 18 cases lived 10 years.
4. Schippers: 4 of 145 cases living 4 years.
5. Hyman: 94% dead in less than 5 years.
6. MacKenzie and Parkins: 13 cases, 11 dead, 2 living 7 years and 2 years.
7. Kerr: 14 cases, 12 dead in less than 4 years, 1 living 59 months and 1 living 52 mos.
8. Geschickter and Weidenhorn: 25 cases with no 5-year survivals.
9. Bothe: 7 cases all dead in 3-1/2 years or less.
10. Dean and Pack: 16 cases, 13 dead and 3 lost from follow-up.
11. Priestley and Broders: 65 cases, 40 cases followed, 36 dead, 1 living 13 years, 1 living 3 years, and 2 living 3 months.
12. Ladd and White: 60 cases, 8 5-year survivals, 6 living 2 to 4 years.

Authors' series: 10 of 13 cases dead in 4 years or less (9 in 14 months or less). 3 cases living, 1 for 4 years and 8 months, 1 for 3 years and 1 for 2 years.

TABLE VIII -- A Brief Summary of the 13 Cases of Wilms' Tumor

Proved Cases (Diagnosed by Nephrectomy, Biopsy or Autopsy)

Case No.	Age	Sex	Treatment		Metastases			
			Surgery	Irradiation	At Diagnosis	Late	Living	Dead
1.	1-1/2 yr	F	Nephrectomy Sept. 1934	Aug. 1934, Nov. 1934 to abdomen & lungs	Both lungs			Exp. Dec. 1934 (3 mos.)
2.	3 years	M	Nephrectomy Jan. 1936	Dec. 1935, Mar. 1936	None	Lungs		Exp. Sept. 1936 (8 mos.)
3.	1-1/2 yr	M	Nephrectomy Dec. 1938	Oct. 1938, Jan. 1939	None	None	June 1943 4 years	
4.	3 mos.	M	Nephrectomy Sept. 1940	Sept. 1940 (post-op)	None	None	Oct. 1942 2 years	
5.	4 years	M	None	Oct. 1940 to abdomen and lungs	Both lungs	None		Exp. Jan. 1941 (3 mos.)

Unproved Cases (Diagnosed by Clinical Symptoms, X-ray findings & Appearance at Laparotomy)

6.	6 years	M	Laparotomy Sept. 1926	Aug. 1926, Dec. 1926	Questionable	None		Exp. Oct. 1930 (4 years)
7.	11 yrs.	F	None	Nov. 1929, Mar. 1930	Both lungs			Exp. Apr. 1930 (5 mos)
8.	6 years	F	Laparotomy Jan. 1931	Jan. 1931, Apr. 1931		Both lungs		Exp. Mar. 1932 (14 mos)
9.	6 years	M	None	To abd. mass Oct. 1931 & Feb. 1932 To both lungs Nov. 31	Both lungs			Exp. May 1932 (7 mos)
10.	3 years	M	None	March 1936	Both lungs			Exp. June 1936 (3 mos)
11.	9 mos.	M	None	Apr. 1938, Aug. 1938	None	None		Exp. Feb. 1939 (10 mos.)
12.	3 years	M	None	Oct. 1939	Both lungs			Exp. Dec. 1939 (2 mos)
13.	2 years	F	None	Apr. 1940 & Aug. 1940 to abdominal mass Rt. lung Aug. 1940 Lt. lung Feb. 1941		Both lungs	Jul. 1943	

Carcinoma of the Kidney Pelvis

There were 9 cases of carcinoma of the kidney pelvis treated at the University Hospitals from 1933 to 1940 inclusive. Seven cases are proved histologically, and 2 are unproved cases diagnosed by clinical symptoms, urography and appearance of the tumor at exploratory surgery at which nephrectomy was not done.

Eight of this group were males. Males usually outnumber females in this lesion, Priestley reporting a ratio of three to one. The youngest patient was 39 and the oldest was 71. The average age was 54 years. Hematuria was the most frequent symptom, occurring in 7 of the 9 cases. It was the initial symptom in 2 cases and an associated symptom in 5 cases. The longest duration of hematuria before admission was 3 years and, incidentally, this patient was alive and well in September 1942, 7 years after pre-operative X-ray therapy and nephrectomy. Hematuria is a very common symptom in carcinoma of the renal pelvis. It was present in 100% of Waters' series. Portmann does not give any figures but states that it is an almost constant symptom.

There was pain in the flank in 4 cases, and in the back in 3. Because tumors of the renal pelvis tend to cause obstruction and infection more than do tumors of the parenchyma, pain is a relatively common symptom. Weakness and weight loss were present in 3 cases.

Seven of the 9 patients have been followed until the close of the study. Of the other two, one was followed for 2 years and then lost from follow-up, and 1 was lost from follow-up immediately after discharge. Two of the patients are living and well at the present time, one after 7 years and one after 3 years. One patient expired in February 1943, 5 years and 9 months after laparotomy and X-ray therapy. Table 9 gives a brief summary of these cases.

The radiation therapy was administered to the tumors of the renal pelvis in the same manner and amount, and with the same precautions as to the cortical tumors.

In some of the cases, because of the tendency for tumors of the pelvis to implant along the course of the ureter, the fields were extended to include the ureter of the involved side.

Carcinoma of the renal pelvis is a radio-resistant tumor. Bothe has pointed out that many of the cellular characteristics of this lesion are antagonistic to radiation therapy. He feels that it is of value only in palliation. Waters and Lewis²⁰, Waters³⁷ and Munger¹⁹ all found this tumor in their experience to be radio-resistant. For this reason many investigators recommend X-ray therapy only if the tumor has extended outside of the renal capsule (8, 17, 35). Priestley states that in his series X-ray therapy has not been shown to be of any value in this lesion.

There is a marked tendency in carcinoma of the renal pelvis for the occurrence of malignant implantations along the course of the ureter and in the bladder. For this reason, a complete nephro-ureterectomy, including a cuff of bladder at the ureteral orifice, is the operation of choice. This has been the procedure at the University Hospitals for the past several years. O'Connor¹⁷ states that he believes the survival rate in this lesion will probably continue to improve because of the increasing use of this type of operation. Frequent cystoscopic examinations of the bladder are indicated in order that malignant implantations may be found as quickly as possible. Dean feels that the tumor is not infrequently confined to the urinary tract and a complete nephro-ureterectomy, including a cuff of the bladder at the ureteral orifice will entirely remove it. If the lesion is confined to the renal pelvis, metastases do not develop (35).

The results of treatment in this tumor are poor. Gilbert and MacMillan reported a series of 55 cases with no 5-year survivals. MacKenzie and Parkins reported a 13% 5-year survival. In our 6 proved cases treated before the end of 1937, one survived for more than 5 years (16%).

TABLE IV -- A Brief Summary of the 9 Cases of Carcinoma of the Kidney Pelvis

Proved Cases

Case No.	Age	Sex	Treatment Surgery	X-ray	Results
1.	56	M	Nephro-ureterectomy with coagulation intramural portion of bladder Jan.1934	Pre-oper. Aug.1933	Living and well Aug. 1940, 7 yrs after start of therapy
2.	55	M	Nephrectomy Oct. 1934 Ureterectomy Dec. 1934	Post-oper. Dec.1934, Sept. 1935	Expired Feb.1936. Late metast. to axilla, surgical scar and chest. (Survived 16 months)
3.	39	M	Nephro-ureterectomy Feb.1935 Partial cystectomy July 1935	Post-oper. Jul.1935 Sept. 1935	Living and well in 1937 and then lost from follow-up
4.	59	M	Nephrectomy Feb. 1935	None	Expired May 1935. Survived 3 mos.
5.	68	M	Nephrectomy Oct. 1935 Ureterectomy Dec. 1935	Post-oper. Oct. 1935	Expired June 1936. Survived 8 mos.
6.	71	M	Intracapsular nephrectomy April 1937	Post-oper. May 1937	Lost from follow-up
7.	48	M	Nephrectomy Aug. 1939	Post-oper. Aug.1939	Living and well Dec.1942, 3 years and 4 months after therapy

Unproved Cases (Diagnosed by gross appearance at laparotomy, pyelography and symptoms)

8.	40	F	Attempted nephrectomy Aug. 1934. Tumor not removed because of bleeding	Post-oper. Nov. 1934	Expired Aug. 1935, one year after surgery
9.	49	M	Laparotomy May 1937	Post-oper. Aug.1937 Jan.1939 & Sept.1941	Expired Feb.1943. Survived 5 yrs 9 months after start of therapy.

Results of Treatment of Malignancy of the Kidney

<u>Author:</u>	<u>5-Year Survival</u>	<u>Treatment:</u>
1. Hunt & Hager	18%	Nephrectomy and some X-ray Therapy
2. MacKenzie & Parkins	16%	Nephrectomy and X-ray Therapy
3. Beer	34%	Nephrectomy (no statement as to X-ray)
4. Walters	43% 17%	Nephrectomy and post-operative X-ray X-ray and radium only
5. Mintz & Gaul	11% (1900-23) 16% (1924-35)	Mostly surgery " "
6. Priestley	38%	Nephrectomy and some X-ray Therapy
7. Hyman	15%	Nephrectomy and X-ray Therapy
8. Braasch	10%	
9. Neff	15%	Nephrectomy. No X-ray Therapy
10. Judd & Hand	26%	Surgery and some X-ray Therapy
11. Chute	15%	Nephrectomy. No X-ray Therapy
12. Israel	34 cases ---	18 deaths from metastases in 2 years
13. Garceau	43 cases ---	39 deaths from metastases in 3 years
14. Cunningham	31 cases ---	22 deaths from metastases in 3 years

Author's series (treated up to and including 1937)

	<u>No. of Cases</u>	<u>5-year Survivals</u>	<u>Percent 5-yr Survivals</u>
Carcinoma of the Cortex			
1. All cases admitted and proved (absolute survival rate)	58	17	29
2. Cases receiving immediate post-operative prophylactic X-ray therapy	24	10	42
Carcinoma of the Pelvis	6	1	16
Wilms' Tumor	2	0	0
All malignancies of the kidney	66	18	27

Conclusions

1. In spite of improvements in methods of treatment, the mortality from malignant lesions of the kidney remains high.
 2. Apparently the greatest obstacle to the reduction of this high mortality rate is the advanced stage of the lesion in most cases when first seen.
 3. Hematuria is the symptom most likely to bring the patient to the physician in time to make possible an early diagnosis. Therefore, every unexplained case of hematuria should have a thorough urological investigation.
 4. Nephrectomy is the treatment of choice for malignant tumors of the kidney, with perhaps the exception of Wilms' tumor. In Wilms' tumor irradiation seems to be of greater value than in any other malignant renal neoplasm and should constitute an important part of the therapy. We feel that if surgery is used, it should be in conjunction with pre- and post-operative irradiation.
 5. X-ray therapy is a valuable adjunct to surgery by: (1) facilitating nephrectomy in many cases by reducing the size of the tumor, (2) perhaps rendering malignant cells dormant and reducing the danger of producing metastases by the manipulation at surgery, and (3) inhibiting the growth of malignant cells which might be left behind.
 6. In cases not suitable for surgery and not having metastases, X-ray therapy may be very valuable in prolonging the life of the patient and affording palliation.
 7. X-ray therapy is of value in the treatment of late metastases and recurrences. Life may or may not be prolonged, but relief of pain is frequently marked.
2. A classification of renal tumors, both malignant and benign, previously published, by Bell, has been included and used in this report.
 3. The clinical picture of renal malignancy, as brought out by these cases, has been presented with a brief discussion of the more common symptoms.
 4. Therapy consisted of surgery alone (17 cases), surgery plus irradiation (48 cases), and irradiation alone (13 cases). The technique of the roentgen therapy used in these cases has been discussed.
 5. Only those cases proved by histological study have been used in compiling the survival rates.
 6. The results of therapy in these cases has been presented.
- In adenocarcinoma of the cortex, the 5-year survival of cases treated by surgery alone is 50%; by surgery plus irradiation 31%; by surgery plus immediate post-operative irradiation 42%; by irradiation alone 8% (77% had metastases at the time of diagnosis).
- In the Wilms' tumors, there were no 5-year survivals. However, 3 cases are still living and well with no evidence of disease, the longest for 4 years and 8 months.
- In carcinoma of the pelvis, the 5-year survival rate is 16%.
- The 5-year survival rate for all malignancies of the kidney (proved histologically) is 27 percent.

Summary

1. An analysis has been made of 117 cases of malignant renal neoplasms seen at

the University of Minnesota Hospitals from 1924 to 1940, inclusive. This group is made up of 94 adenocarcinomas of the cortex (81 proved histologically), 13 Wilms' tumors (5 proved), 9 carcinomas of the renal pelvis (7 proved) and one proved sarcoma.

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III. GOSSIP

Dr. William H. Hengstler announces the association in partnership of Dr. Walter P. Gardner under firm name of Drs. Hengstler and Gardner in the Practice of Neuropsychiatry with offices at 1068 Lowry Medical Arts Bldg., St. Paul, Minnesota....Milan Novak, Professor and acting head Department of Bacteriology and Public Health, University of Illinois College of Medicine in writing concerning another matter comments on the Pediatricians who have been developed by Dr. McQuarrie to assume headships at L.S.U., Tulane, Utah, and Texas. He feels those of us who stay and do the hard job do not receive the proper credit. He expresses his gratitude for all at Minnesota who influenced his career....The University of Illinois Medical School under Dean Ray Allen is really doing things. Ray is another Minnesotan who has gone out and made good. He has just completed consolidation of Rush, Presbyterian Hospital, Illinois Eye and Ear Institute, Research and Educational Hospitals, Illinois Neuropsychiatric Institute and Institute for Juvenile Research....A nice letter from Bert Dippel telling of the new department in Obstetrics and Gynecology, School of Medicine, University of Utah, Salt Lake City. Dr. and Mrs. Emil Holmstrom are established in a comfortable apartment down the valley from the Dippels. She has mastered the art of cooking Swedish meat balls which causes her husband to beam with pleasure. Bert speaks of his own son now aged 8 1/3 months as the apple of his eye (as his daughter was also the apple of his eye, the eyes have it.) John Anderson's polio ward is one of the large services there. The Utah representatives wish to be remembered to all their friends at Minnesota....Another letter from Ralph V. Platou at Tulane hoping that someone from Minnesota will come down and do the technical work for him. Jane Weber who is now with the Waves, was one of our graduates who filled the bill so well that he hopes to have some one else from Minnesota to help him....The Minnesota Society for the Control of Cancer is sponsoring a special school of instruction at the Center for Continuation Study for public health nurses and field workers. First day, instruction will be given for field workers, and the program on the 2nd and 3rd day will be

on case finding, treatment, diagnosis of the common forms of cancer. Nearly 100 women will attend....To Eau Claire, Wisconsin to participate in the 10th District Medical Society Cancer School. The "400" is one of the Northwestern's best trains, as it makes the run between Minneapolis and Eau Claire in less than two hours. I wonder what passengers think when the conductor reads and rereads their ticket. They try to appear so unconcerned. I once had a friend who made a fortune printing railroad tickets and railroad forms. They are so complicated that once he established his business he enjoyed a life long success. At Eau Claire a large number of young men boarded the train for an induction center. This seems to be a constant occurrence at this point. To my hotel room to listen to the radio and shortly to hear myself speak. It is a queer sensation, but very instructive as far as studying speech faults is concerned. At the dinner decorations featured the sword of knowledge symbolic of cancer education. More than 52 physicians and nearly 100 women were in attendance. A Scandinavian with a heavy Minnesota dialect referred to the various speakers on the program in humorous fashion. Apparently, he made mistakes when he first learned the language and now he finds them as funny as anyone else. He did a neat job of leg pulling by referring to the ranking speakers on the program with yours truly as the rankest, and to the representative of a leading clinic in Eau Claire whose name rang true throughout the community. The physicians were told that the good ladies hoped to do something about the cancer problem by memorizing the early signs and symptoms and acting promptly when they appeared. They also hoped to have examinations for occult disease when they came for their physials. In order to overcome fear and ignorance they had learned the nature, cause, and behavior of new growths. They had a speaking knowledge of cancer research and were familiar with modern methods of diagnosis and treatment. In addition to acquiring this information they passed it on to others. Only in America could laymen and physicians sit down and discuss common problems. Physicians are to be complemented for their willingness to cooperate in these public health campaigns....