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

Treatment of Pituitary Tumors

lume XIII | Friday, March 6, 1942 | Number 19

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

Volume XIII | Friday, March 6, 1942 | Number 19

INDEX

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.

I. LAST WEEK

Date: February 27, 1942

Place: Recreation Room
Powell Hall

Time: 12:15 to 1:15 P.M.

Program: "Hay Fever in Children"
Albert V. Stoesser

Discussion
A. V. Stoesser
Irvine McQuarrie
R. V. Ellis

Present: 156

Gertrude Gunn,
Record Librarian

- - -

II. MEETINGS

1. ANATOMY SEMINAR

Saturday, March 7, at 11:30 A.M. in room 226, Institute of Anatomy.

Jean Hay Dougherty - "A review of the literature on the etiology of leukemia."

Robert H. Reiff - "Myeloid metaplasia."

2. SEMINAR ON THE STRUCTURE AND BEHAVIOR OF PROTEINS

Thursday, March 12, at 8:00 P.M., Room 15, Medical Sciences.

Professor M. H. Roepke - "Virus Protein Studies."

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3. PATHOLOGY SEMINAR

Monday, March 9, at 12:30 P.M., Room 104, Institute of Anatomy.

S. Bernick - "Giant cell tumors of mandible."

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4. CLINICAL RESEARCH CLUB

Monday, March 9, at 8:00 P.M., in Eustis Amphitheatre.

Milton Levine and Heinz Siedentopf - "An apparatus providing continuous filtration in blood transfusions."

Samuel Schwartz - "Chromatographic study of biological pigments (with demonstration)."

John J. Boehrer - "Diet studies in college students (preliminary report)."

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5. CENTER FOR CONTINUATION STUDY PROGRAMS

March 23-28	Kenny Method of Treating Poliomyelitis - for medical directors of training schools of physical therapy technicians (Joint sponsorship by National Foundation for Infantile Paralysis).
March 23-28	Diseases of Rectum and Colon - for general practitioners and others.
March 26-28	Anesthesiology for nurse anesthetists.
March 30-Apr. 1	Roentgenology of Head and Neck - for roentgenologists.
April 6-18	Internal Medicine - for specialists in internal medicine.
April 30-May 2	Obstetrics or Gynecology - for obstetricians and gynecologists.

III. TREATMENT OF PITUITARY TUMORS

Jules D. Levin

The purpose of this report is to call attention to methods accepted today in the treatment of pituitary tumors, to analyze the pituitary tumor treatment results at the University Hospitals during the past 15 years, and to compare our results with those obtained elsewhere.

Anatomy and Physiology

The pituitary gland, or hypophysis cerebri, is an egg-shaped grey mass about the size of a bean, attached to the tuber cinereum by a cone-like stem, the infundibulum, and situated in the sella turcica, which is a deep, dural-lined depression in the sphenoid bone just above and posterior to the sphenoid sinus. The bulbous portion of the gland consists of two lobes, (a) an anterior lobe, originating from the roof of the pharynx, and Ib) a smaller posterior lobe which arises from the floor of the third ventricle. About the upper portion of the body of the gland the dura forms a circular fold, the diaphragma sellae, with an ample foramen thru which the infundibulum passes.

Pituitary tumors of clinical interest are limited essentially to those of the anterior lobe, and arise from one or more of the 3 types of cells found in this lobe: (a) acidophil or eosinophil cells with granules staining with eosin; (b) basophil cells with granules staining with haematoxylin; the eosinophil and basophil cells are classed together as the chromophil cells; (c) the chromophobe cell with non-granular cytoplasm which stains faintly. The chromophobes make up about 50% of the total cells, the acidophils about 39%, and the basophils about 11%. The chromophobe cells are the mother cells and may differentiate into either of the chromophilic types. The chromophobe cells are generally thought to be without secretory function. The somatotropic or growth and development regulating principle is elaborated by the eosinophil cells, while the gonadotropic or reproductive regulating principle is produced by the basophil cells. The chromophil group is also credited wit the production of thryotropic, adrenotropic, lactogenic, and diabetogenic principles.

Incidence and Pathological Physiology

Intracranial neoplasms constitute nearly 2% of tumors found at operation or necropsy. Pituitary tumors make up approximately 6% of intracranial tumors or about 0.12 percent of all tumors; roughly, 1 out of every 800 tumors is located in the pituitary gland. Costello in a study of 1000 pituitary glands in routine necropsy examinations, found adenomata of microscopic size in 22.5%.

Tumors of the pituitary gland are usually benign adenomata. The occasional malignant tumor is adenocarcinomatous. The benign adenomata are divided into 3 main groups according to their cell origin: (a) chromophobe adenoma, which is the commonest variety of pituitary tumor, gives pressure symptoms only, (including symptoms of pituitary insufficiency by a compression of functioning eosinophil and basophil cells). The adenoma often remains confined to the sella, causing disturbance only in skeletal and sexual development. More frequently, however, it distends the sella and may ultimately reach such size as to implicate the optic nerves, optic chiasm, and optic tracts, as indicated by visual field changes. If it breaks thru the membranous roof and presses on the tuber cinereum, hypothalamic adiposity may be super-added. (b) The acidophil adenoma, which occurs a good deal less frequently than does the chromophobe adenoma, is associated with overgrowth, i.e., gigantism and acromegaly. (c) The basophil adenoma, which gives rise to the well-known Cushing's syndrome, is the least common of the benign group. The malignant adenoma is relatively rare. It destroys the bone of the base of the skull, bursts thru the roof of the sella, invades the floor of the third ventricle, and causes spontaneous decompression, thus accounting for the fact that malignant adenomata are relatively symptom-free in the early stages as compared with the benign adenomata.

The incidence of the various types of pituitary tumors in Cushing's series of verified tumors over a period of 20 years (1913-32), and in our series over a period of 15 years (1926-41), is as follows:

Types of Pituitary Tumors

Adenoma	Cushing's		University Hospitals	
Chromophobe	260	77%	10	32%
Acidophil	67	20%	15	49%
Basophil	-	-	5	16%
Malignant	11	3%	1	3%
Total	338	100%	31	100%

It should be noted that Cushing described the basophil adenoma and syndrome in 1932, hence, in his series this type may have been included in other groups.

Pathological disorders from excessive or insufficient secretion of the various cells are associated with adenomata of anterior lobe. Acidophilic hyperpituitarism leads to gigantism when the process antedates ossification of epiphyses, and to acromegaly when it is of later origin. Hypopituitarism leads to adiposity, with skeletal and sexual infantilism when the process originates in childhood, and to adiposity and sexual infantilism of the reversive type when originating in the adult. Hyperpituitarism may be either acidophilic or basophilic in type, in the former with excessive secretion of the growth hormone, in the latter, superabundant secretion of sex hormone. Hypopituitarism may also be either acidophilic or basophilic, the former representing the obverse functional state as regards growth, the latter involving deficiency of sex hormone. Many gradations and combinations of the above occur clinically and may be explained by the following: a tumor of one cell type may cause symptoms due to perversion not only of its own secretion but also of secretion of the other cells, the latter being caused by pressure atrophy due to encroaching tumor.

Symptoms and Signs

When the pituitary gland is involved in tumor growth the symptoms and signs may be grouped into those due to perversion of cell secretion and those due to mechanical encroachment and increased intracranial pressure. The clinical features of acromegaly, gigantism, Cushing's and Frohlich's syndromes, and the sexual dystrophies are classic. The signs and symptoms due to mechanical effects are of special interest, for it is the progression or regression of these symptoms and signs that furnishes us with an index of efficiency of treatment.

Adenomata usually extend upward and backward between the optic nerves and under the chiasm and cause optic nerve and optic tract lesions which vary from decreased vision, visual field defects, and choked discs, to optic atrophy. The incidence of one or more of such visual disturbances in the University Hospitals' series is shown below:

Visual Disturbances in University Hospitals Series

Present	23	74%
Absent	8	26%
Total	31	100%

The variation of visual symptoms and signs is due to extreme variation of anatomical relations of optic nerves, optic chiasm and optic tracts to the pituitary. The anatomical variation in length of the optic nerves and the angle at which they meet to form the chiasm is shown in the slides. Generally the angle formed by the junction of the optic nerves and the chiasm is acute, the intracranial segment of the optic nerve is long, and the chiasm is far back, that is over the dorsum sellae; if the intracranial optic nerve segment is short, the angle is wide, blunt, and U-shaped, the optic chiasm rides over the tuberculum sellae. Sometimes, when the intracranial nerve segments are long and the chiasm is post-fixed (i.e., it lies far back over the pituitary and the dorsum sellae), the nerve-chiasm angle may be wide open because the optic nerves are less convergent as they approach the chiasm. This forms a larger space in front of the chiasm and between the optic nerves. Usually, great

elongation of the optic nerves results in a post-fixed chiasm, with most or all of the hypophysis anterior to the chiasm. Short intracranial optic nerve segments result in pre-fixed chiasm, with the pituitary posterior rather than anterior to the chiasm.

The anterial cerebral arteries frequently cross over the optic nerves to converge toward the beginning of the great longitudinal fissure of the brain. If the anterior cerebral artery passes over and comes in contact with the optic nerve it may compress the nerve, producing a groove in front of the chiasm when the chiasm is elevated by an upward growth of pituitary tumor.

Bitemporal hemianopsia or temporal visual field defect in both eyes is an important sign in pituitary tumors, but other types of field defects also occur. In the tumors at the University Hospitals visual field defects were seen in 19 out of 31 cases or in 62%. When present, bitemporal hemianopsia is called the "signature of hypophyseal tumors." In our series bitemporal hemianopsia was present in 3 out of 19 cases showing visual field defects or in 16% of all. With few exceptions hemianopsia due to pituitary tumors is deliberate in its development. It is an advancing process and may be divided into stages. The early findings may be mere visual field constriction; the defects usually begin in the upper temporal fields and proceed downward, and in the lower nasal fields and proceed upward.

X-ray Changes

Roentgenography of the sella and sphenoid sinus of the skull frequently shows changes in pituitary tumors. Encroachment upon the sphenoid sinus has been reported in 50% of cases at the first visit, while erosion of the dorsum sellae and the posterior clinoids was present when the process was of long duration (Frazier). Incidence of roentgen findings in our series is shown below.

Roentgen Findings in Pituitary Tumors
University Hospitals

Sellar enlargement and erosion	25	80%
Normal sella	6	20%
Total	31	100%

Great increase in depth of sella suggests that the growth is primarily intrasellar. Altho roentgenographic changes are diagnostic of pituitary tumor, their absence does not rule out a pituitary lesion since these changes are not always present early in the disease.

Treatment

Three methods are available for treatment of pituitary tumors: irradiation, surgery, and combinations of the two. Endocrine therapy is frequently used as an adjunct to the above methods, many times with gratifying results, but it is not a basic method of treating these tumors.

Results in pituitary tumor therapy depend upon clinical judgment; in some instances irradiation alone may produce the desired effect; in others, it is immediate surgery; in others, it is surgery and irradiation. Some of the factors in the choice of therapy, together with results obtained, based upon our experience and that of others, is shown below.

Roentgen Therapy

Since Beclere's and Gramegna's first report on irradiation of pituitary tumors (1908) improvement in methods has been made, and the results are much better than those of earlier days. Until recent years little more than palliative therapy was administered to pituitary tumors because there was the impression that brain tumors were radioresistant and there was the fear that large doses of irradiation would damage normal brain tissue. It is now known

that large doses, properly administered, do not damage the normal tissue.

Superficial tumors may receive moderate doses of irradiation thru a single portal, but deeply situated tumors, like those of the pituitary, must be treated more vigorously thru multiple portals. The technic of irradiation employed here at the University Hospitals' Department of Radiation Therapy is as follows:

220 K.V., 15 milliamperes, Filter = 1 Cu. + 1 Al. H.V.h. = 1.7 mm. Cu. 1200 r. (in air) given to each of three fields - Right lateral, left lateral, and anterior superior. Total dose of 3600 r. given in 17 days. 1440 r. to tumor.

Same dose may be repeated in 6 months if necessary.

Of the 3 groups of pituitary tumors, the basophil adenoma is the most radioresponsive. The effect of irradiation is noted through decreased secretion of the hyperplastic and hyperfunctioning cells. Reports of the results of irradiation treatment of basophil adenomata are meagre. Most authors agree, however, that irradiation is the treatment of choice, that definite improvement in symptoms occurs with adequate radiation therapy. Our limited experience bears this cut.

Irradiation of Basophil Adenoma

Patients treated:	5	
Vision involved:	3	60%
Vision not involved:	2	40%
Vision improved:	3	100%
Vision not improved:		0%
Headaches present:	4	80%
No headaches:	1	20%
Headaches improved:	3	75%
Headaches unchanged:	1	25"

Acidophil adenomata, whose host complains chiefly of headaches and endocrin disturbances, are moderately radiosensitive, and here, too, irradiation gives a better result than surgery. Occasionally there is rapid fatal proliferation in pituitary tumors, especially in acidophil types, even after several years of spontaneous symptomtomatic inactivity. Kaplan therefore suggests that irradiation therapy should be administered on the assumption that the tumor is actively proliferating. Hence, in apparently mild acidophil adenomata, intensive therapy is used to inhibit any possible growth. Rand and Taylor (1935) stated that in their 20 pituitary tumors all 5 of their acidophil adenomata showed marked improvement with irradiation therapy, as evidenced by definite visual field improvement. Our experience also bears out this observation.

Irradiation of Acidophil Adenomata

Total	13	
Vision involved:	9	70%
Vision not involved:	4	30%
Vision improved:	7	78%
Vision unchanged:	2	22%
Headaches:	11	85%
No headaches:	2	15%
Headaches improved:	8	73%
Headaches not improved:	2	18%
No follow-up:	1	9%

That irradiation therapy is superior to surgery for acidophilic and basophilic adenomata is generally accepted, but there is considerable difference of opinion as to the best method of treating chromophobe adenomata. These tumors act mechanically to produce symptoms, distending the sella, compressing the optic nerves and chiasm, with resulting visual disturbances. Surgical treatment removes the bulk of the tumor and relieves the pressure, but it is not certain that irradiation will recue the size of the tumor. Irradiation, producing hyperaemia and edema of the tissues, may tem-

porarily increase the size of the tumor so that at the beginning headaches may be increased in intensity and visual disturbances may be more pronounced. Some consider this to be an indication for surgical decompression before irradiation. Satisfactory remission of signs and symptoms were obtained in approximately 50% of the patients with chromophobe adenomata irradiated by Sosman, which is less favorable than his results in acidophil adenomata. Rand and Taylor, in contrast to most observers, noted their best response in chromophobe adenomata. Our results compare favorably with those of others:

Irradiation of Chromophobe Adenomata

Total patients	9	
Vision involved:	9	100%
Vision normal:	0	-
Vision improved:	6	67%
Vision unchanged:	3	33%
Headaches:	8	89%
No headaches:	1	11%
Headaches improved:	7	88%
Headaches unchanged:	2	12%

Most authors believe that solid tumors respond to irradiation better than cystic varieties. In cystic tumors, surgery gives good immediate results due to decompression of the tumor. Irradiation should follow surgery to preclude recurrences and it should be started within 6 weeks to 3 months.

In 63 adenomata of the pituitary treated with irradiation by Dyke and Hare, 26.4% of 36 chromophobes were improved and 40% of 25 acidophils. Surgery alone improved 68% of the chromophobes in Cushing's series reviewed by Henderson.

Pfahler and Spackman recommend that irradiation should be given routinely to all pituitary tumors in the following manner: 200%, 1600 r through 3 portals in 3 months; if at the end of this time there is no improvement, but rather progression of symptoms, resort to surgery. Sosman believes that 6 months of treatment is advisable, and that surgery should be employed only in those patients who do not respond. If early visual fiel defects are detected irradiation may be effective in preventing progressive loss of vision, but it is difficult to decide how long it should be employed to the exclusion of surgery. It is generally agreed that the status of the visual fields and visual acuity is the important index to improvement following therapy, and it is the only guide which will determine whether to continue to irradiate or to resort to surgery. Length of life is no indication of value, for pituitary tumors do not as a rule kill; they merely disable; restoration of health and activity is the important thing, and especially is restoration of sight. In a series of tumors seen at Bellevue Hospital, recently reviewed by Kaplan, there was no regression in any bony change, and if an enlarged sella was demonstrated roentgenographically, there was no evidence of shrinking or of sclerosis in the walls following arrest of symptoms. Therefore, the visual fields and not the x-ray findings of the sella must serve as an index of therapeutic measures The importance of frequent visual field examinations cannot be over-emphasized.

Irradiation in tumors of the pituitary is a therapeutic measure of established value. When large doses of irradiation are employed, tumors heretofore considered radio-resistant are brought into the radiocurable group. When properly administered, intensive treatment does not destroy normal brain tissue. Chamberlin, Sachs, Sosman, and Grant all agree that irradiation trial should precede surgery, except in patients with rapid and fulminating visual failure.

Surgical Therapy

In 1897 Giardano proposed a transphenoidal approach to the pituitary body, and this operation was first successfully performed in 1907 by Schlaffer. The transfrontal operation was done by Krause in 1908, using the same approach that he employed in 1900 for the extra-

ural removal of a bullet in the region of the optic nerves. Frazier is credited with popularizing the transfrontal approach. Since Krause's and Schlaffer's original ventures numerous modifications of both approaches carry such familiar names as von Eiselsberg, Kanavel, Halstead, Hirsch, Frazier, Cushing, and Heuer.

The following comparison of the operative mortalities during the various periods well demonstrates the progress in pituitary surgery:

Operative Mortality
During Various Periods

1905	(Horsley) - - - - - - -	70 - 80%
1911	(Hirsch 12 cases) - -	16.6%
1912	(Cushing 29 cases) - -	13.7%
1912 to 1931	(Cushing 360 cases)- -	6.2%
1928 to 1931	(Cushing 39 cases)- -	5.7%
1939	(Grant 143 cases) - -	10.0%

Surgical treatment of pituitary tumors is limited to those neoplasms producing visual disturbances. Unless the adenoma has become so large that it displaces the optic nerves laterally and the optic chiasm posteriorly, the chiasm rides so close to the tuberculum of the sella that it is impossible to enter the sella without injury to the optic nerves. Dandy advocated making the transfrontal approach to the pituitary from the side of poorest vision and if necessary section of this optic nerve to expose the lesion. Other neurosurgeons suggest approach from the side of maximum vision because one can better see the good optic nerve and thus avoid injury to it. Complete removal of pituitary tumors is not possible because of the danger of tearing the vessels of the circle of Willis, and also because of the great probability of trauma to the hypothalamus. Intracapsular enucleation is the more safe and proper procedure.

Most neurosurgeons agree that in advanced and progressive increased intracranial pressure or encroachment on the chiasm and optic nerves, immediate surgery is indicated. Sudden visual failure, as manifested by rapid diminution of visual fields and visual acuity also requires prompt operation. Grant believes that unless irradiation gives definite improvement in visual findings within 6 weeks, surgery is indicated. Other observers extend the period of trial from 3 to 6 months. The continuation of severe and intractable headaches which are not influenced by irradiation is considered by some neurosurgeons to be sufficient indication for surgical exploration.

The transnasal or transphenoidal approach has been abandoned in favor of the transfrontal route for several reasons:

1. The transfrontal approach gives a better exposure, facilitating a more thorough removal of the tumor, decreasing the possibility of recurrence; also allowing more adequate exploration of suprasellar and chiasmal structures.

2. The transfrontal route decreases incidence of postoperative meningitis for it is an aseptic route in contrast to the one through the potentially infected sphenoid sinus.

3. The mortality rate has been lower with transfrontal operation.

The transfrontal route entails a right transfrontal craniotomy; the frontal lobe is elevated and the dura is separated from the anterior cranial fossa. Dissection continues posteriorly to the wing of the sphenoid bone and then to the midline. The dura is incised on the anterior crest of the sella and the incision is carried laterally for 2 cm. along the wing of the sphenoid bone and anteriorly parallel with the falx for 3 cm., in order to obtain adequate exposure of the chiasmal structures. The vessels on the capsule of the tumor are coagulated before the capsule is incised; the intracapsular contents are removed by curets, pituitary forceps, and aspiration. The capsule is then dissected free from the nerves and vessels and drawn forward into the pre-chiasmal space where it is re-

sected. Bleeding is controlled by compression with cotton pledgets or coagulation. For best results the tumor is extensively removed with a minimum of trauma. Most authors agree that cystic chromophobe adenomata lend themselves best to this treatment.

The following chart shows the changing methods of treatment of such adenomata in the various periods since the beginning of pituitary surgery:

Treatment in Chromophobe Adenomata

1913-19 - - - Transphenoidal surgery alone
1920-28 - - - Transphenoidal surgery plus irradiation
1929-35 - - - Transfrontal surgery with or without irradiation
1936-present- Irradiation trial before transfrontal surgery, with irradiation as follow-up therapy.

Cushing has the largest and best studied series, by Henderson, of pituitary tumors. The mortality rate in 260 cases of all types of pituitary tumors that came to surgery was 4.9%. This is lower than others (approximately 10% in Grant's series of 143 cases). The results with surgery and surgery and irradiation based on visual improvement is shown in the following:

Improvement after Surgery of all Types Based on Visual Improvement

Surgery alone (Grant)	38	55%
Surgery plus X-ray (Grant)	46	70%
Surgery plus X-ray (Cushing)	247	71%
Irradiation alone (Grant)	10	Increase in efficiency 69% to 87%.

In our own series surgery was employed in 5 cases. In 2 the surgery was done outside of the University Hospitals. Four of the 5 were in extremis at the time of operation and expired shortly after. The remaining patient was given postoperative irradiation therapy and has improved considerably (followed for 9 years).

The following shows percentages of patients alive and symptom-free in Cushing's series:

Patients Alive and Symptom-Free after Treatment

Interval Post-Op.	% Patients Alive	% Symptom Free
5 years	76.6%	70.5%
10 years	57.7	53.0
15 years	44.0	40.6
20 years	31.6	38.1

The next chart shows the percentage of 5-year cures (no evidence of recurrence) according to the various periods of surgery, in Cushing's series:

Five Year Cures According to Periods of Surgery

1913-19 - - - - - - - - - -	20%
1924-26 - - - - - - - - - -	55%
1929-32 - - - - - - - - - -	71%

The chart below is a comparison of 5-year cures in Cushing's series with use of surgery alone and with irradiation plus surgery:

Five Year Cures According to Method of Treatment

Surgery alone - - - - - -	45.2%
Surgery plus irradiation-	76.2%

Bailey and Cutler report 3 malignant adenomata of the pituitary all treated surgically with follow-up irradiation; there were 2 operative deaths and one 4-year cure. Rand and Taylor report 2 pituitary malignancies both treated with irradiation with no effect on course of disease. Our experience with one malignant growth is similar to that of Rand and Taylor.

Conclusions

1. Irradiation is the treatment of choice in basophil adenomata, acidophil adenomata and malignant adenomata of the pituitary gland.

2. Surgery finds its greatest usefulness in the treatment of chromophobe adenomata.

3. There still remains a difference of opinion regarding the treatment of non-cystic or solid chromophone adenomata. In general, surgery is preferred.

4. Irradiation alone may be used, in chromophobe adenomata, if there is continued improvement in vision.

5. Surgery is indicated when there is progressive visual loss despite irradiation therapy and should be employed when vision fails to show improvement.

6. Immediate surgical intervention is indicated in all types of pituitary tumors when there is sudden rapid visual failure.

7. Irradiation prior to surgery is of definite value and it probably does not make surgery any more difficult.

8. Irradiation following surgery prolongs the period of relief and prevents recurrences.

9. Constant cooperation between the ophthalmologist, neurosurgeon, and roentgenologist is of utmost importance in the rational treatment of pituitary tumors.

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IV. GOSSIP

Word from the Unit has been received in many letters to staff members and friends. An optimistic, cheery reply from our chief Lieutenant-Colonel L. Haynes Fowler speaks of a plane ride which he took from Fort Sill to a post in Texas-apparently it was a good will tour to introduce our commanding officers to their neighbors in the south. This trip was in sharp contrast to the icy, slippery ride by car which Colonel Fowler made from Minneapolis to Fort Sill. The arrival of the advance guard of officers brought great joy to the early birds. Everyone speaks warmest terms of the attitude and helpfulness of the commanding officer assigned to the Unit from the army, Lieutenant F. V. Kilgore. Apparently, nothing was left undone to make everyone comfortable. The Unit is quartered in comfortable wooden barracks. The chiefs of the medical and surgical services, Colonels Borg and Fowler, are located in the permanent officers' quarters. Colonel Fowler sends his best regards to all and thanks everyone for their courtesy up to and including the time of departure of the unit. Word from Colonel Kilgore was equally encouraging. He had many nice things to say of the character of our staff and their evident accomplishments. He also spoke of the great pleasure it was giving him to serve with U.S.General Hospital 26. A card from Warner F. Bowers, Major, Medical Corps, formerly of Fort Leonard Wood, Missouri, gives his new address as station hospital, Camp Chaffee, Fort Smith, Arkansas as of March 1. He has been appointed chief of the surgical department in an 850 bed hospital. Major Bowers also asked to have the roster published and here it is.

Executive

Commanding Officer - F.V.Kilgore, Lt.Col.
Sanitary Officer - Theodore Olson, 1st Lt.
Mess Officer - Robert M. Barr, Maj., M.C.
Receiving Officer - Gordon C. MacRae, Maj.M.C.
Registrar - Albert Hayes, 1st Lt., M.C.
Detachment of Patients - Robert Rogers, 1st Lt., M.C.
Asst. Medical Supply Officer - Norman C. Holte, 2nd Lt., M.A.C.
Asst. Mess Officer - Dale D. Shephard, 2nd Lt., M.A.C.

Medical Service

Joseph F. Borg, Lt.Col., M.C.
Reuben Erickson, Maj., M.C.
Douglas P. Head, Maj., M.C.
Philip Hallock, Maj., M.C.
Samuel A. Weisman, Maj., M.C.
Harvey Beck, Maj., M.C.
Thecdore J. Bulinski, Cap., M.C.
Randall S. Derifield, Capt., M.C.
William H. Hollinshead, Capt., M.C.
Robert E. Johnson, Capt., M.C.
Russell C. Lindgren, Capt., M.C.
Stanley W. Lundblad, Capt., M.C.
Lawrence M. Nelson, Capt., M.C.
David M. Craig, 1st Lt., M.C.
Robert A. Green, 1st Lt., M.C.
John R. Haserick, 1st Lt., M.C.
Charles G. Polan, 1st Lt., M.C.
Vern C. Strough, 1st Lt., M.C.
Rodney F. Sturley, 1st Lt., M.C.

Surgical Service

L. Haynes Fowler, Lt. Col., M.C.
Edward T. Evans, Maj., M.C.
Jerome-A. Hilger, Maj., M.C.
John R. Paine, Maj., M.C.
A. G. Plankers, Maj., M.C.
Wallace P. Ritchie, Maj., M.C.
George S. Bergh, Capt., M.C.
John D. Galloway, Capt., M.C.
Mayer Z. Goldner, Capt., M.C.
Lyle French, Capt., M.C.
Lyle Hay, Capt., M.C.
Conrad J. Holmberg, Capt., M.C.
Karl E. Sandt, Capt., M.C.
Leonard Titrud, Capt., M.C.
Herman Koschnitzke, 1st Lt., M.C.
Richard E. Reilley, 1st Lt., M.C.
Baxter A. Smith, 1st Lt., M.C.
Vincent Swanson, 1st Lt., M.C.
Arnold Kremen, 1st Lt., M.C.
Frederick B. Mears, 1st Lt., M.C.

Laboratory Service

Robert Hebbel, Maj., M.C.
Paul Kabler, Capt., M.C.
Evrel Larson, Capt., M.C.

X-ray Service

Oscar Lipschultz, Maj., M.C.
Jack Chalek, Capt., M.C.
Eugene E. Ahern, 1st Lt., M.C.

Dental Service

Earle W. Nelson, Maj., D.C.
Charles Peterka, Capt., D.C.
Harold G. Worman, Capt., D.C.
Lyle A. Brecht, 1st Lt., D.C.
Virgil R. Ohlen, 1st Lt., D.C.
Anthony J. Scholtis, 1st Lt., D.C.

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Nurses

Edna L. Aderman
Daralene U. Buscher
Audra B. Bush
Ann H. Busko
Reona P. Christensen
Jean D. Conklin
Dorothie H. Elliott
Esther O. Emanuelson
Viorene A. Flygare
Adeline M. Gorder
Catherine M. Haggar
Gladys M. Halvorson
Eunice V. Hansen
Ruth A. Hanson
Lucia A. Helm
Evelyn B. Horstman
Bernett A. Jaeger
Alice M. Johnson
Myrtle E. Kitchell
Dora E. Larson
Ernestine F. Liermann
Bertha A. Luker
Margaret Manchester
Dorothy H. McLean
Ione E. Peterson
Sylvia E. Pavlovich
Jeane Ramey
Helen C. Redpath
Helen G. Spaeberg
Gudrun E. Stenoien
Florence A. Tenney
Catherine M. Thorene
Helen G. Vennes
Helen M. Walch
Willifred West

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