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

Acute Meningitis

Volume XIV | Friday, February 19, 1943 | Number 16

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
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INDEX

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William A. O'Brien, M.D.

I. LAST WEEK

Date: February 11, 1943

Place: Recreation Room
Powell Hall

Time: 12:15 - 1:25 p.m.

Program: "Estrogens and Carcinoma of the Prostate"
C. D. Creevy

Discussion
Leo G. Rigler
Gerald T. Evans
K. W. Stenstrom

Attendance: 84

Gertrude Gunn,
Record Librarian

- - -

II. MEETINGS

1. ANATOMY SEMINAR

Saturday, February 20 at 11:30 a.m. in room 226 Institute of Anatomy.

"Sex Differences in the Rate of Emptying of the Human Gall Bladder in Pernicious Anemia."
E. A. Boyden

"Cells of the Neurohypophysis."
Richard N. Winger

- - -

2. PHYSIOLOGY-PHARMACOLOGY SEMINAR

Tuesday, February 23 at 12:30 p.m. in room 214 Millard Hall.

"Nutritional Factors Affected by Rancid Fat."
Richard H. Barnes

- - -

3. INTERDEPARTMENTAL SEMINAR

Wednesday, February 24 at 8:00 p.m., Eustis Amphitheater.

"Assimilation of CO_2 by Isolated Mammalian Heart"
V. Lorber
A. Hemingway
A. O. C. Nier

"Experimental and Clinical Investigations with Penicillin"
Wesley W. Spink
Jean Jermsta Vivino

- - -

4. BACTERIOLOGY SEMINAR

Thursday, February 25 at 4:30 p.m. in 214 Millard Hall.

"Microbial Antibiosis."
A. T. Henrici

- - -

5. ALPHA OMEGA ALPHA - WILLIAM ROOT LECTURE

Tuesday, March 9 at 8:30 p.m. in Fine Arts Reception Room, Coffman Memorial Union.

"The Marriage of Medicine and Government"
Dr. Haven Emerson

- - -

III. ACUTE MENINGITIS

Robert H. Alway
Erling S. Platou

Bacterial infections complicated by meningitis are of special interest at the present time. The acute meningitides due to the meningococcus, pneumococcus, streptococcus, staphylococcus and H. influenzae present a serious problem. Conflicting reports regarding the best therapeutic measures for the acute meningitides continue to appear in the literature. Any logical treatment must be from two fundamental angles: immunologic and chemotherapeutic. In the following communication the desire is to emphasize the fallacy of assuming that the sulfonamides are always adequate and that serotherapy need be used only when chemotherapy is failing. Not only has the treatment suggested for meningitis too often been oversimplified but, in our opinion, too many far reaching claims have been made for chemotherapy alone. An evaluation of the host's immune response is notably absent in almost all reported studies.

The appraisal of a new therapeutic agent in acute meningitis is difficult. The many factors governing prognosis and the statistics relative to results obtained must be interpreted critically in order to reach a clear understanding of therapeutic effectiveness. Meningitis varies greatly from patient to patient and from time to time in a community. The age of the individual and the duration of the illness before treatment is initiated play significant roles in the outcome. When a case recovers, it is well to remember that a little search may well reveal instances of the same type of infection recovering without any specific measures having been employed.

There is evidence that in infections with the pneumococcus, meningococcus and influenzal bacillus the virulence definitely varies with a different type. In addition the dosage of pathogenic organisms is important. The outcome in any case of acute meningitis is the result of the pathogenicity of the organisms and of factors contributing to the resistance of the host.

Factors in Prognosis

New therapeutic agents may bring about dramatic improvement in the general fatality rate. For example, the fatality rate in streptococcus meningitis prior to the introduction of sulfanilamide was close to 100%. It is now reported to be as low as 15-25% [1,2,3]. The fatality rate for meningococcus meningitis, in sporadic groups of cases, is reported to have decreased from 50% to about 10% since 1937.[3,4] United States government reports, however, show a drop from 55% to 45% between 1933 and 1936, but only from 39% to 35% between 1937 and 1941. The improvement is more apparent than real. Sulfonamide therapy is generally given credit for the apparent marked improvement, but other factors must be seriously considered.

It is known that Group I meningococci account for the majority of epidemic cases. In carriers and sporadic cases, however, the Group II meningococcus is usually found.[5] This latter is less invasive and more apt to produce chronic infection. Group I meningococci constituted 90% of the strains isolated in 1936.[6] Group I has been less frequent each year since 1936 with a corresponding increase in Group II. A lowered fatality rate has been reported for the pneumococcus and H. influenzae meningitis[3,7,8] as well as for meningococcus. When cases reported are separated into age groups, it is found that in the extremes of life, particularly infancy, the least improvement prevails.[9,10,11] Top found no reduction in the fatality rate of meningococcus meningitis in children under 3 years of age since sulfonamides have been used. Public Health Service reports for 1939 show a greater number of meningitis deaths from birth to 5 years than in any other age groups.

The increased case fatality rate in the extremes of life is not due to variation in virulence of type pathogens[12] or

to inability of the host to use conferred antibodies.[13] In part this increased fatality rate may be explained by two factors. One is the frequent failure of meningitis to manifest itself as such in early infancy. The second is the failure to make an early bacteriological diagnosis in those cases over one year of age. Anatomic, physiologic and immunologic differences probably play a significant role in the increased fatality rate in infancy and old age. It is well known that the immune response of a host varies with age. This has been shown by Sutliff,[14] Fothergill,[15] Hodes[16] and others. A definite lack of immunity to the pneumococcus exists between 10 days and 2 years of age.[14] It has also been demonstrated that the blood of children between 2 months and 3 years of age has no antibacterial antibodies against influenzal bacilli.[15] Hodes[16] attempted to immunize children against the type I pneumococcus. All the children over 2 years of age showed a sharp rise in antibody titre, while a significant rise occurred in only one case under 2 years of age. More common clinical examples of poor antigenic response can be found in infants, under 6 months of age, who have been innoculated too early against pertussis and diphtheria.

Pathogenesis and Biology

The problems of treatment are directly concerned with the peculiarities of pathogenesis and the biology of the particular bacteria in any type of meningitis. It is not our intention to discuss the biology of these bacteria in detail. The bacteria responsible for meningitis usually reach the meninges by the hematogenous route. Rarely there may be direct traumatic implantation. Burman suggests that otorhinogenic meningitis results from the entrance of bacteria into the blood stream from the accessory sinuses or the temporal bone. Burman and others feel that most cases of meningitis are secondary to a bacteremia and that a direct extension is a rare occurrence. Shaw states that the meningococcus invades the blood stream from a minute focus in the upper respiratory tract or from a purulent focus. There is then a loss of integrity of small blood vessel walls due to the toxic products (capsular carbohydrate) of the meningococcus. This allows the entrance of the bacteria into the blood stream. Through capillary injury they escape into the meninges.

Single or multiple lumbar or cisternal taps have been believed to play a role in the pathogenesis of meningitis. There is considerable experimental evidence to support this view[17,18] as well as clinical reports suggesting that lumbar puncture was a factor in the causation of meningitis, particularly in the presence of bacteremia.[19] Siebert[20] reports 4700 lumbar punctures, only one of which was followed by meningitis. Pray[21] concludes that except for isolated cases, lumbar puncture in the presence of bacteremia does not clinically cause meningitis. Regardless of the danger it is better to do a diagnostic tap, especially in infants, than miss the diagnosis.

Three of the pathogens under consideration may be discussed together. These are the meningococcus, pneumococcus and H. influenzae. These constitute an immunological group in that they possess similar chemical components acting as antigens.[12,13] Each of these organisms is surrounded by a capsule containing a specific carbohydrate (specific soluble substance), which is secreted into the surrounding medium. It has been shown in the case of the pneumococcus that type specificity and invasive ability depend on the capsular carbohydrate. Antibody must neutralize the free carbohydrate before it can neutralize that of the capsule of the organism. The quantity of free specific capsular carbohydrate in the patient is an index of the severity of the infection as well as an indicator of the amount of anticarbohydrate antibody necessary for neutralization and recovery. There is no evidence that sulfonamides influence the production of antibody by the host. Antibody is an essential part of the recovery process. Alexander[12] states that there is every reason to believe that the biology of the meningococcus and H. influenzae is similar to that of the pneumococcus. The evidence available suggests that the protective antibody in both anti-H. influ-

enzae and anti-meningococcus serum is the anti-carbohydrate antibody. Therefore since the capsular carbohydrate seems to be the invasive factor in the meningococcus, pneumococcus and H. influenzae, any effective treatment must consider the elimination and neutralization of this substance.

Ferry[22] claims to have shown that the meningococcus has an exotoxin. This may be the capsular carbohydrate. Four meningococcus types have been established according to serologic reactions. Branham[6] classifies the Gordon and Murray types I and II in Group I. Group II meningococcus differs in that its type specificity is intimately connected with protein rather than a carbohydrate.[23] Group II infections respond poorly to the available polyvalent serum. A group II antiserum is difficult to produce. As previously mentioned, Group II meningococci are more apt to produce chronic infection and often cause septicemia without meningitis. Meningitis due to the pneumococcus is almost invariably secondary to a primary focus.[21,24] No specific pneumococcus type appears to be meningotropic. Meningitis occurs as a complication of head injury in about 6% of the cases.[25] In these the pneumococcus is usually the causative organism.[26] Spinal fluid smears showing pleomorphic organisms should be considered strongly suggestive of H. influenzae meningitis. The type B. H. influenzae causing meningitis is encapsulated and grows in smooth colonies,[27] while the influenzal bacilli frequently found in the respiratory tract are non-capsulated, usually avirulent and grow in rough colonies. Lancefield Group A streptococci are almost invariably responsible for human disease. Hemolytic streptococci are the type of streptococcus usually found in meningitis. Although staphylococci have been classified on the basis of colony pigment production as well as by serologic reaction, coagulase production is probably the simplest means of differentiating pathogenic and non-pathogenic strains.[28] Virulence may be correlated with staphylococcus invasive properties as well as the toxins formed by it. The staphylococcus may enter the blood stream from the nasopharynx as well as through minor abrasions and trauma. Staphylococcal bacteremia occurs frequently in the presence of obvious focal infections as well as where no portal of entry can be found.

Action of Therapeutic Agents

Sulfonamides and antisera are the specific agents available for the treatment of acute meningitis. The part played by immune bodies has been largely overlooked in the general enthusiasm for the more easily used and generally more effective sulfonamides.

Antibody is an essential part of the recovery mechanism whether it is formed by the host as the result of infection or introduced by serum therapy. The production of antibodies in man and experimental animals is not influenced by chemotherapy.[13] There is as definite a correlation between antibody production and recovery in the drug treated patient, as in those who get well spontaneously. The principal action of the sulfonamides apparently is bacteriostatic.[29] This facilitates the defense mechanism of the host. Many patients will recover with chemotherapy alone. Some, however, because of the severity of the infectious process and others because of an insufficient immunologic response will need additional help in the form of specific antiserum. The antisera for the pneumococcus and Haemophilus influenzae act against the capsular carbohydrate. The available meningococcic antisera contain group "antitoxin" as well as specific antibacterial factors against the prevailing four types (Gordon) of organisms. Potent staphylococcal antitoxin is now available. Although it has no antibacterial effect, it may be of definite value in saving a patient's life. Erythrogenic toxin, produced in varying amounts by any of Griffith's 33 types of hemolytic streptococcus, is important in the pathogenesis of hemolytic streptococcus infections including scarlet fever.[30] Its prompt neutralization is important. Pooled human convalescent scarlet fever serum contains anti-invasive antibodies as well as erythrogenic antitosin. The use of this serum is

valuable in the treatment of Group A streptococcus infections.

Evaluation of Immune Status

At the onset of meningeal infection, when possible, an evaluation of the immune status of the host should be carried out. In this way complete therapy can be instituted at once instead of at a point where irreparable damage may have already been done. Since the amount of antibody essential for recovery varies with the severity of the disease, a quantitative approach would be desirable. It is now possible to determine the amount of antibody in some serums in terms of milligrams of antibody nitrogen per unit volume. In the case of anti-type B H. influenzae serum and pneumococcus serum analyses by this method parallels that by mouse protection methods. In some types the need for and adequacy of serum therapy can be tested objectively. A rapid diagnosis of meningococcic and H. influenzae meningitis, when no organisms can be found, can be made by means of the precipitin reaction. Cleared spinal fluid is used to overlay a few drops of diagnostic serum.[31,32,33] A positive test consists in the formation of a white ring at the interface. Alexander feels that the time of appearance of the ring is a index of the amount of free specific soluble substance and therefore a measure of the severity of the infection. A severe infection is believed to be present if a ring appears within ten minutes. The continuance of a positive precipitin test, using the patient's serum instead of diagnostic serum, after supposedly adequate therapy indicates the necessity for more vigorous treatment. The Francis test[34] in pneumococcus infections and an analogous test[35] in H. influenzae meningitis indicates the absence or presence of excess free anti-carbohydrate antibody fairly reliably. A further method to determine antibody excess is identical with the one used to type the organism. The patient's serum is used in place of diagnostic serum. The aim is to have such an excess of antibody that a 1:10 dilution of the patient's serum will produce capsular swelling. A further point of value in the initial estimation of the severity of the infection is the spinal fluid sugar level. It is apparently lowered in proportion to the severity of the process and will rise often before the cerebro-spinal fluid cell count or the patient's condition reflect improvement.[36] The foregoing applies to meningitis due to the meningococcus, pneumococcus and H. influenzae.

Results at Minneapolis General Hospital

Statistics should be interpreted carefully in meningitis. As previously mentioned, there are too many factors affecting the prognosis. Mere numerical reports without qualifying remarks are misleading. The following example is illustrative. Six cases of meningococcus meningitis have been admitted to the Contagion Service at the Minneapolis General Hospital since January 1st of this year. Three have died. The case fatality rate is 50%. It would seem ridiculous to give significance to a case fatality rate based on so few cases, yet this appears to be done repeatedly. Furthermore, two of the three deaths occurred within an hour of admission to the hospital. The first had been ill less than 24 hours. The second had been ill about 48 hours, but had been considered as hysteria until shortly before admission. The third patient who expired lived 48 hours after admission and, although circumstances beyond our control mitigated against him, his death might rightly be considered a possible result of treatment in some way inadequate.

Acute Meningitis 1922 through 1942

Minneapolis General Hospital

	1922-1936		1937-1942		Total	
	No. Cases	No. Deaths	No. Cases	No. Deaths	No. Cases	No. Deaths
Meningococcus	240	92	34	5	274	97
Pneumococcus	85	85	20	17	105	102
H. influenzae	17	17	7	4	24	21
Streptococcus	137	135	13	3	150	138
Staphylococcus	15	15	3	1	18	16

No conclusions based on the small number of cases treated since 1936 should be made beyond saying that better therapy has resulted in apparently better results. We feel that prompt evaluation of the patient's status on admission and the use of combined sulfonamide-serum therapy will give markedly better results in the future.

Prophylaxis of Meningococcus Meningitis

The discovery of some effective prophylactic agent or procedure against meningococcic infections obviously would be of great value in the event of an epidemic. This is particularly so since the disease is spread almost entirely by carriers and not by cases.[37] The current concentration of large groups of men increases the likelihood of an epidemic. It is believed that an increase in the carrier rate to over 20% is definite warning of an impending epidemic. Dudley and Brennan, however, found a carrier rate of 13% with 11 cases, but no cases when the carrier rate was 55%. During the war of 1914-1918 it was found that the only effective measures were adequate ventilation in sleeping quarters and the separation of beds by at least 3 feet.

There are several reports suggesting that the sulfonamides may be of value prophylactically. Meehan and Merrilees[38] were unable to control a series of outbreaks of cerebrospinal fever in a foundling hospital until they gave sulfapyridine to all the carriers. Following this no further outbreaks occurred. Fairbrother[37] believes that sulfonamides will have only a limited application for wholesale use, but that they are of definite worth in clearing proven carriers if used in adequate dosage. Harries[39] in Cardiff feels that the danger of developing a drug fast strain mitigates against the prophylactic use of sulfonamides. In the past year Gray and Gear[40] have used sulfapyridine prophylactically during an epidemic in a military camp in Natal. The carrier rate dropped from 22% to zero. These reports are suggestive but do not warrant optimism without similar trials.

Suggestions for Treatment

Any patient suspected of having meningitis should have a lumbar puncture as quickly as possible. The spinal fluid obtained should immediately have the following examinations: cell count and differential, stained smear examination and culture, and quantitative determination of sugar and protein. Organisms resembling pneumococci, meningococci or H. influenzae may be typed by the Neufeld technic. As previously mentioned, in those cases in which the spinal fluid shows no organisms, cleared spinal fluid may be tested for type B H. influenzae and meningococci by means of the precipitin reaction.

The treatment of the acute meningitides will be discussed under these categories: lumbar puncture, sulfonamide therapy, serotherapy, fluids and blood, elimination of foci and the use of complement.

Meningococcus meningitis.

One lumbar puncture for diagnosis is

usually sufficient. Further lumbar punctures may be done after 48 hours, if there is reason to doubt the efficacy of the treatment or if signs of increased intracranial pressure appear. Hoyne[41] states that one should do as few punctures as possible, for not only is increased intracranial pressure not efficiently relieved, but also opisthotonus and even the likelihood of hydrocephalus is increased by repeated lumbar punctures.

All the common sulfa drugs appear to be effective in the treatment of meningococcus meningitis. The dosage used should be sufficient to maintain a blood level of between 5 to 15 milligrams per cent. It is not evident that higher levels are more effective. The route of administration depends in part on the condition of the patient. The optimum blood concentration should be obtained quickly. Therefore the initial dose should be given intravenously. A 1-5% solution of the sodium salt of sulfapyridine, sulfathiazole or sulfadiazine in normal saline may be used. The 1% solution would seem preferable for two reasons: it maintains the blood concentration at a higher level over a longer period of time and also provides additional fluid. The sodium salts also may be given as a 0.5% solution in physiological saline subcutaneously. The intravenous or subcutaneous routes are an additional advantage in patients unable or unwilling to cooperate. The crushed tablets or a solution of the sodium salt may of course be given through an indwelling gastric tube. The drug should be continued until the patient has been afebrile 4-5 days and then decreased gradually.

Serum should be given to any meningococcus meningitis in the extremes of life[42,43] and to any case seriously ill. Experimentally combined chemoserotherapy is definitely superior.[5,44,45] It is advisable to give intravenous fluids containing one of the sulfonamides for a period of three to four hours before the serum. The reasons and details will be referred to in connection with influenzal meningitis. The intrathecal administration of serum is not indicated.[41,46] Experimentally it has been found that horse serum intrathecally produces an intense meningitis.[5] It seems unreasonable to rely on the circulation of the spinal fluid to transport antibodies, when the blood can do it both more quickly and directly. If within 48 hours the patient does not show definite improvement, 100,000 units antimeningococcus serum should be given intravenously after sensitivity tests. This wait appears to be safe, at least in the non-epidemic cases. Thalhimer,[47], however, stresses the point that serum is best given early, in adequate doses and intravenously. When given intramuscularly it takes about 18 hours to reach the maximum antibody titre in the blood. This titre is only half that obtained by intravenous administration. If, because of sensitivity, the serum cannot be given intravenously, it should be given intraperitoneally.[43,47] This gives an excellent absorption of antibodies within 2 hours and the chance of untoward reaction is no greater than when given intramuscularly. McLeod[42] feels that all meningococcus meningitis should be grouped serologically as soon as possible. If the case does not respond with chemotherapy and polyvalent serum, then the serum with greatest mouse protective action against the type found should be used. Vasile[48] obtained poor results with commercial sera, but good results with serum prepared from locally isolated strains of meningococcus. Both antitoxin and antiserum lots vary in effectiveness.[49] In addition most polyvalent sera are low in mouse protective antibody content for the Group II meningococcus.[50] The majority of commercial serum now available is both antibacterial and antitoxic.

The patient's fluid and electrolyte balance should be maintained by oral liquids if possible, and parenterally if necessary. Repeated small blood transfusions are indicated. Freshly drawn blood is at least theoretically preferable to stored bank blood because of greater antibody activity.

Influenzal meningitis.

In influenzal meningitis at the

Minneapolis General Hospital we have followed the treatment recommended by Alexander[13] as closely as possible. A continuous intravenous drip of .1 gram per kilogram body weight of sulfonamide in 40 cc. per kilogram of saline or Ringer's solution is started at once. Sulfadiazine appears to be the drug of choice. This is given over a four hour period for the purpose of inhibiting further formation of free carbohydrate and accelerating the excretion of that free carbohydrate already present.

Anti-type B influenzal rabbit serum is then given intravenously, diluted in 200-300 cc., of sulfonamide containing saline or Ringer's over a 2 hour period. The initial dose of serum is determined by the spinal fluid sugar level.

Schedule of dosage based on spinal fluid sugar.[13]

Spinal fluid sugar (mgm.%)	Mgm. antibody nitrogen
15	100
15-25	75
25-40	50
over 40	25

The adequacy of the dose is checked one hour later and in 24 hours by testing the ability of the patient's serum to produce capsular swelling. The original spinal fluid kept on ice after adding 0.4% formalin will serve as a course of encapsulated organisms. The aim is to have sufficient antibody so that a 1:10 dilution of the patient's serum will produce capsular swelling. If no quelling occurs, then an additional 50 mgm. antibody nitrogen is given. Lumbar puncture should be repeated 24 hours after the original tap for determination of sugar, cell count and culture. Further punctures will depend on the patient's course. Repeated small transfusions are indicated. Occasionally an otitis occurs coincident with influenzal meningitis; this should be treated as necessary. Sulfonamide therapy should be continued for one week after the first sterile spinal fluid or for two weeks of normal temperature, for recurrences are not infrequent. A febrile response to the serum is not uncommon and is misleading. In those cases not responding to above mentioned treatment the intrathecal administration of 5 cc. human complement may help.

Pneumococcus meningitis.

The same outline of treatment applies to pneumococcus meningitis as was described for influenzal meningitis. Sulfadiazine and type specific rabbit serum should be used. In determining the initial dose of type specific rabbit serum 1 mgm. antibody nitrogen is equivalent to 1000 units. Chemotherapy should be continued in full doses one week after the spinal fluid is sterile. Particularly in this type of meningitis foci of infection should be looked for. They should be eradicated if possible.

Streptococcus meningitis.

Sulfadiazine or sulfanilamide in doses sufficient to maintain blood levels of 10 and 15-20 mgm.% respectively should be given. It should be continued one week after the patient is afebrile and the spinal fluid is sterile. Pooled human scarlet fever convalescent serum should be given if available.[30] Repeated small transfusions and the eradication of any focus of infection are important.

Staphylococcus meningitis.

The principal points in treatment are the same as mentioned for streptococcus meningitis. Sulfadiazine, as in each of the others, appears to be the best drug. Sulfathiazole, however, contrary to general belief is probably effective. The use of staphylococcus antitoxin intravenously is recommended. The initial dose should be 100,000 units.

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Public Health Reports 55:2340, '40.

IV. GOSSIP

In Chicago at the meeting of the council on medical education and hospitals with many Minnesotans in evidence. The conference on medical service on the first day had attracted many representatives from here interested in economics. On the second day the educators were more numerous. Dean Harold S. Diehl, now occupies an important spot in American medicine, because of the splendid job he has done with procurement and assignment. His remarks at the meeting were received with marked attention and interest and immediately after the session he was surrounded by a large number of well-wishers. The Palmer House is now Chicago's main meeting place with the other large hotels converted to military purposes. Long lines of people wait to be assigned to reserved rooms. The restaurants are crowded and the spacious halls provide plenty of parking space for the medical educators and administrators. Saw Herman Hilleboe who was assigned to the navy by the United States Public Health Service for the duration. He is deep in his tuberculosis case-finding project and has learned that doing one job at a time is an effective way to get results. The United States Public Health Service representatives sometimes appear in navy uniforms, sometimes in army uniforms, depending on the assignment...One doctor at the meeting has just crossed his legs, revealing that he did not take his pajamas off this morning (probably to keep warm as they are stuffed in his socks inside his pants). Ray Allen, dean at Illinois, is enjoying his usual superb health and is doing a fine job. Ed Norris, dean at Wayne, is full of plans in connection with his new building project. Former Minnesotans with the American Medical Association include Peterson, in industrial medicine; and Arestad, in medical education and hospitals. Jean Currem, dean at Long Island, is a Minnesotan from Winona and Rochester. He went to medical school elsewhere, but he still has fond memories of his early days in Minnesota. Fred Carter, now a hospital administrator biggy from Cleveland, is glad that his infant dysentery epidemic is over and that he is out of the headlines. He received all sorts of letters advising him just what to do and an equal number as to what not to do. Tulane University through Dean Kostmayer wishes to thank Minnesota for the splendid representatives we have there. He was interested in learning if Allan Hill was everything we had been led to believe. I assured him the appraisal was correct. There is much conversation about the army and navy curriculum requirements. The surgeon-general of the navy conducts himself with his usual poise and friendliness. According to Dr. McIntyre navy doctors are doctors. He prefers to be called doctor and calls all navy medical officers by the same title. One general is present. He is the representative in internal medicine on the surgeon-general's staff (Morgan). Donald Balfour speaks with enthusiasm of graduate education at Minnesota. It is interesting to watch the pattern unfold with increasing emphasis on the age of 26 for admission to graduate studies, a minimum of 3 years of training program in clinical medicine, and the emphasis on pre-clinical preparation...Saw Rob Radl of Bismarck at the dentists' convention in Minneapolis this week. He is now a major and is stationed in St. Paul replacing Lieut. Col. Hullsiek, who has been ordered to duty elsewhere...Word is coming through concerning the whereabouts of some of our former interns and graduates. Dr. Steinberg, an intern at the Minneapolis General last year is now suffering with malaria after his service in the "hot spot," Guadalcanal. Dr. Stenberg of Hudson has also been sent back after coming in contact with a machine gun and other powerful ammunition. He is somewhere over there resting up. Studies by the United Public Health Service reveal the serious implications of allowing too many young men to go into service. Young men under 45 apparently do twice as much work as those over 45....I took my young son with me for the train ride to Chicago. I never enjoyed anything quite so much as he gave uninhibited first hand impressions of everything he saw. He visited with his godfather and godmother in Chicago while I went to the meetings. The thing which took his eye was the elevated. On the evening ride to the station to take our train home, watching the lights in the city and running along without interruption was the thrill. Other things he found interesting included the airplanes in the ceiling of the station, soldiers, red street cars, porters, berth, and what have you.....