

shock are instituted and the operative procedure is carried out as soon as possible. Palpation of localized swelling often indicates the approximate position of the fracture. This becomes more obvious if an ecchymosis is seen when the head has been shaved. As soon as a patient with a severe head injury is admitted, the patient's blood is matched with blood in the blood bank. This has proved to be a most worth while measure, because blood loss in the pediatric age group is less well tolerated than in older subjects. A polyethylene tube is inserted in the exposed saphenous vein while the patient is still in the emergency ward.

#### OPERATIVE PROCEDURE

After complete shaving of the head, the skin of the suspected side is prepared with suitable antiseptic solutions and so widely draped that the exposure, if necessary, can be carried from the foramen spinosum to the superior longitudinal or lateral sinus. Should ligation of the external carotid artery be contemplated, it is advisable to include the neck in the preparation and draping. Local infiltration of 0.5 per cent procaine hydrochloride with epinephrine is used on all patients. Open drop ether anesthesia is often necessary as a supplement if the patient is restless or struggling. The incision for the initial burr hole is placed so that it can be extended to expose the temporal bone for a classic subtemporal decompression. If the clot is in the frontal region, the bone flap is turned down in the manner originally described by Cushing.<sup>6</sup> In small infants, it has been more expedient on several occasions to use heavy scissors in making the bone flap. On discovery of a clot, a blood transfusion is started, if it has not already been instituted as a resuscitative measure. If the bleeding is arterial, tantalum clips or silk sutures are used for hemostasis. Absorbable hemostatic materials, judicious endothermy coagulation or clipping is used for venous sources of hemorrhage. In most cases the brain expands rapidly to its normal volume. At this point it is well to open the dura in order to inspect the subdural space and cortex, so as to determine whether there is subdural bleeding or cortical damage. It has not been necessary in this series to leave a dural decompression unless extensive cortical damage has been apparent. All layers of the wound are closed with silk. If a large dead space remains, a drain from the dura is left in place for twelve to sixteen hours and sulfadiazine and penicillin are given prophylactically for forty-eight hours. Burr holes are done on the opposite side of the calvarium at a later date in children in order to determine the presence or absence of a contralateral clot. In infants, subdural taps through the open suture lines yield sufficient evidence to establish the presence or absence of a subdural clot.<sup>7</sup>

Postoperatively, general supportive care is given. Lumbar punctures are carried out daily if the initial spinal fluid examination reveals evidence of bleeding into the subarachnoid space. This procedure is continued until red blood cells in the spinal fluid count fall below 500 cells per cubic millimeter. Lumbar punctures are continued if there are signs of increased intracranial pressure, hyperthermia or a change in neurologic signs. The pressure is customarily reduced

by one-half at each lumbar puncture. Most of the infants and younger children tend to regenerate bone over their areas of bony decompression within a year.

#### MORTALITY

Eighteen patients are living and 2 dead. One of the patients who died had severe cerebral laceration and thrombosis of the superior longitudinal sinus. The other died with hyperthermia. Of the 18 surviving patients, only 1 had a neurologic deficit. This patient has had one convulsion and has a persistent mild hemiplegia. It is interesting to note that this patient had decerebrate postural patterning before operation.

#### SUMMARY

Extradural hematoma proved by operation occurred twenty times in a series of a little over 1,000 pediatric patients treated for head injury. The differential diagnosis is discussed. The signs manifested by the patients in the series are listed and considered in regard to the mechanics of the skull. The indications for trephination are given. This is the only certain method of diagnosis and of adequate treatment. The operative procedure is outlined. There were 2 deaths in a series of 20 infants and children.

## THE PROBLEM OF MEDICAL CARE FOR NAVAJO INDIANS

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and

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Recently, considerable comment has been made regarding the health services rendered to Navajo Indians, apparently because the Navajo tribe (numbering approximately 65,000 persons) is the largest Indian tribe in this country and the health services rendered are far from adequate. Several factors enter into this: that the geographic domain of this tribe is large, that travel is difficult, that their culture differs from ours and that the few physicians ordinarily employed have little or no conception of cultural differences or are insufficiently trained to carry out medical inquiry and care of the sick. These, and other similar or contingent criticisms, appear warranted. But statements made with reference to the scarcity of certain diseases among the Navajos are based on insufficient evidence or the lack of diagnostic procedures; such concepts are the cause for much speculation and concern and should be reconsidered in the light of modern medicine.

Generally, physicians have been taken from civil service lists, given no training in colonial field medicine or in the cultural aspects of the problem and sent to field medical duty. These physicians, with few exceptions, are usually poorly qualified, are graduates of inferior medical schools and have received a minimum period of hospital duty required by civil service. In certain instances mission hospitals have given much better service. A complex situation has arisen wherein concepts and ideas have generally become distorted and one sided. One of the features that is most lacking is that there is no connection between the programs and the medical schools. Without the continued

6. Cushing, H.: The Establishment of Cerebral Hernia as a Decompressive Measure of Inaccessible Brain Tumors with the Description of Intermuscular Methods of Making the Bone Defect in Temporal and Occipital Regions, *Surg., Gynec. & Obst.* 1:297-314, 1905.

7. Ingraham, F. D., and Matson, D. D.: Subdural Hematoma in Infancy, *J. Pediat.* 24:1-37, 1944.

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spirit of inquiry and challenge of academic medicine, such field programs have a tendency to fall into dull, uninspired routines. Without a pathologist, a suitable laboratory association, without medical school affiliation, without special training of field physicians (a matter that the London School of Tropical Medicine and Hygiene considers of great importance), the medical program among Indians can be only what it is.

#### PRESENT FACILITIES

Cognizant of this situation last October 1948, the Navajo Indian administrators endeavored to change the type of medical care. First they established a sound working staff at their central hospital and added the diagnostic facilities needed.<sup>1</sup> The men chosen were not necessarily from civil service lists, but did meet, obviously, the civil service requirements. These men had sufficient training to direct adequately a special service. Thus, the base hospital today has a staff consisting of a surgeon in chief, a physician in chief and the other chiefs of staff, such as a pediatrician, a gynecologist, an obstetrician and a pathologist; a dispensary physician, a specialist in eye, ear, nose and throat and a specialist in tuberculosis. To this group is added adequate laboratory personnel. Regular staff meetings are held, papers are read and clinical pathologic conferences introduced. There are two committees, a library committee and a drugroom committee, the first dealing with journals and textbooks being purchased for the library and the second group endeavoring to place the choice of drugs on a scientific basis. The hospital is equipped to carry out special studies, such as metabolism, electrocardiography, roentgenology and bacteriology.

Since July 1, 1948, there have been 2,171 admissions to the hospital service; the outpatient department has had 5,488 new cases with 8,038 repeated visits. In March 1949, the outpatient department reported 906 new patients and 1,514 repeated visits. These figures far exceed any in previous years. It becomes at once apparent that such a number of visits and admissions is beyond the capacity of the staff described and that many of the patients should have been taken care of in the smaller field hospitals on the reservation. Up to April 1 of this year, the pediatric service alone admitted 647 children, and the remainder of the admissions, 1,424 cases, were distributed among the other services.

In the medical service, with about 450 admissions, there were 53 patients with intrinsic cardiac disease varying from pericarditis to mitral stenosis; malignant diseases in all services, exclusive of the outpatient department, occurred in 19 patients. Since many assume that neoplastic disease does not occur among the Navajo Indians, these cases are listed as follows:

Myxosarcoma with metastases.....	1
Carcinoma of the breast with metastases.....	1
Epidermoid carcinoma of the maxilla.....	1
Carcinoma of the cervix, grade III.....	2
Adenocarcinoma of the biliary tract.....	2
Carcinoma of the uterus, grade III.....	2
Carcinoma of the prostate.....	2
Papillary tumor urinary bladder.....	1
Carcinoma of the stomach.....	1
Tumor of the pituitary.....	1
Lelomyosarcoma of the urinary bladder.....	1
Epidermoid carcinoma of the conjunctiva.....	1
Multiple myeloma.....	1
Lymphosarcoma cervical and mediastinal lymph nodes....	1
Seminoma with metastases.....	1

1. One year ago, there was only one dentist for the entire reservation; today there are three full time dentists. At present there are two sanitarians and one sanitary engineer. The hospital nursing staff for the entire reservation, excluding the field nurses, numbers forty-nine registered nurses. The entire program is directed by Dr. Henry W. Kassel, Director of Health, under the general organization in which James M. Stewart is superintendent.

It is at once obvious that both heart disease and malignant disease are present among Navajo Indians and that as the year continues new cases will appear.

Among the 2,171 admissions there were 120 deaths, 10 of which were still births, 43 due to terminal tuberculosis and 48 due to infant mortality. Just within the past few months has the autopsy record been at all commendable, with 9 autopsies having been performed. However, it is to be noted that biopsy material is constantly being submitted to the pathologist, a fact which may in small measure compensate for the low record of autopsies.

For the sake of brevity the surgical service record is shown in the table.

The procedures shown in the table are divided between the gynecologic service and the general surgical service. There were 206 live births in the obstetric service during the period described.

This, then, has been the gradual evolution of the base hospital, the Navajo Medical Center. An affiliation with a medical school is strongly needed. There is a host of unsolved problems—the cause of the diarrheas, the adequacy of the treatment of trachoma, the epidemiologic aspects of trachoma, the nutritional situation of the Navajo, intestinal parasitism, atypical pneumonias, anemias and tuberculosis.

With reference to tuberculosis, the x-ray mobile unit reported that, out of 16,000 persons examined, 1,859

#### Surgical Services

Month	Major Procedure	Minor Procedure	Casts
October 1948.....	6	33	3
November 1948.....	8	53	9
December 1948.....	12	39	12
January 1949.....	10	51	14
February 1949.....	13	40	5
March 1949.....	15	61	3

showed evidence of progressive pulmonary tuberculosis. Yet the sanatorium at Fort Defiance for Navajo Indians has a capacity of only 100 beds. This year's admissions to the sanatorium totaled only 67 patients. Even though the BCG program will alter the course and susceptibility of persons to the disease, the crowded dwellings (hogans) and the presence of open lesions, which yield large numbers of organisms, still prevails and will continue to create the disease in susceptible persons. The base hospital has referred 68 patients to the sanatorium, a number which exceeds those admitted to that institution.

*Field Service.*—The field service now has a hospital at Tuba City, one at Shiprock, one at Winslow and one at Crownpoint. These hospitals have from 30 to 50 beds each and contain a surgical theater, dispensary and laboratory. They should act as the first clearing station and maintain public health programs within their area. An adequate number of field nurses should be obtained for these isolated areas (Winslow is not isolated). The field nurse program has just begun to develop (only two field nurses were present in early 1948; now there are eleven nurses). The program is as yet in its infancy, but plans for a well coordinated field service are being made, which will include immunization and other matters pertinent to field duty. Once again the choice of the physician in these districts is of paramount importance, and the program at Tuba City (Western Navajo area) and Crownpoint (Eastern area) are now showing progress because the physicians are sufficiently qualified to direct such programs.

## COMMENT

It is possible that further small hospital units will have to be developed. So far the field service has been the neglected service; this explains, in part, the heavy load of patients coming to the base hospital at Fort Defiance. Actually, the base hospital should be used for diagnostic purposes, treatment in selected cases, special surgical procedures and research. The field hospitals should send to the base hospital any patient who they feel requires special attention.

The tuberculosis situation needs immediate attention, and facilities should be made available for the care of the tuberculous patient. Here, again, affiliation with institutions specializing in this type of medicine is of supreme importance.

To date the problem of giving medical care to the Navajo Indians is a challenging one and deserves careful study and effort rather than the emotional approach used by many persons. The formula for rendering medical aid to Navajo Indians is by no means solved—advice, criticism and help are solicited and, if given with careful thought, will be greatly appreciated. It is to be remembered that the Navajos have a rich and creative culture and that any program developed must in great measure consider their way of life.

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**Special Article**

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**TREATMENT OF PARAPLEGIA RESULTING FROM TRAUMA TO THE SPINAL CORD**

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(Concluded from page 958)

4. *Blood*.—As already indicated, the first weeks after spinal cord injury are marked by an extremely abnormal blood picture. In the first twenty-four hours there begins a series of poorly understood changes. Serum protein begins to fall sharply, followed later by a drop in hemoglobin, and later by a decrease in red blood cells. At the end of the first week, the serum protein may reach levels below 5.0 Gm. per hundred cubic centimeters, the hemoglobin below 10 Gm. per hundred cubic centimeters and the red blood cells below 3,500,000 per cubic millimeter. In the presence of decubiti and bladder infection, these low levels are usually reached, and the albumin-globulin ratio is reversed. If decubiti are not present at this time, they are most likely to develop unless careful turning is carried out. It is far better to anticipate these changes by the administration of whole blood, calculated as 1 pint (473 cc.) for each 0.5 Gm. that the hemoglobin level is found below 14 Gm. per hundred cubic centimeters. Decubiti are much less a hazard, and, more important, the patient resists infection better, his appetite improves and his general well-being is enhanced. To attempt to combat these changes by the intravenous administration of protein digests,<sup>38</sup> plasma or serum is futile. These infusions must be run almost constantly and do not remain in the blood stream long enough to alter the picture greatly. Then, too, each of these substances leads to sensitization.

38. Elman, R.: Maintenance of Nitrogen Balance by Intravenous Administration of Plasma Proteins and Protein Hydrolysates, *Physiol. Rev.* **24**: 372-389 (July) 1944.

In addition to these substances, decided diminutions in vitamin levels, especially ascorbic acid, will often be found. The general tendency to the routine administration of various vitamins cannot be condoned. In some military hospitals, before meal medication consisted of three full 1 ounce (28 Gm.) glasses of vitamins to each paraplegic patient, almost too much for the patient to consume as the main course of the meal. When deficiencies are indicated by low levels in the blood, the necessary elements should be administered hypodermically until food intake is normal or above, at which time they should be discontinued. It is unlikely that supplementary vitamin D is ever warranted in otherwise normal adults. Furthermore, until more is known of the exact nature of the mechanisms of calcium excretion in the recumbent patient, any agent which is likely to increase calcium absorption from the intestines should be avoided. Vitamin A has been implicated in stone formation.<sup>39</sup> With the factors of recumbency, stasis and infection already present, a deficiency of vitamin A is unlikely to assume much importance. In a large group of "rapid stone formers," no significant difference in the rates or numbers were seen in a group given high supplements of vitamin A as compared with a control group given no supplements. Vitamin C should be given when deficiency can be demonstrated, on the basis of reports that deficiency leads to delayed healing.<sup>40</sup> No deleterious effects from its administration have been noted, but when only traces were found in the blood, as much as 1,000 mg. were needed daily by mouth or 500 mg. by hypodermic injection to restore normal levels. The tendency to withhold citrus fruits from these patients on the basis of the resulting alkaline tide is unwarranted,<sup>41</sup> for these substances serve as a palatable source of fluid, citrate and vitamin C. There is no reason why the B complex vitamins should be given, and yet the repeated demonstrations of their relation to the central nervous system would indicate that they can be given as drugs with benefit,<sup>42</sup> if not as vitamins alone.

The level of nonprotein nitrogen of the blood is found to rise during the early stages after injury and in infections of the upper part of the urinary tract. A rise of the creatinine level implies serious renal damage. Therapy should precede such changes. Urinary calcium will be found to increase sharply within the first week of recumbency and will reach a plateau two to three times normal until ambulation is started, and then it slowly returns to approximately normal levels.<sup>43</sup> It is rare to find any elevation in blood levels of calcium, phosphorus or phosphatase during these striking changes.

39. Higgins, C. C.: *Renal Lithiasis*, Springfield, Ill., Charles C Thomas, Publisher, 1944.

40. (a) Taffel, M., and Harvey, S. C.: The Effect of Absolute and Partial Vitamin C Deficiency on the Healing of Wounds, *Proc. Soc. Exper. Biol. & Med.* **38**: 518-525 (May) 1938. (b) Hartzell, J. B., and Stone, W. E.: The Relationship of the Concentration of Ascorbic Acid of the Blood to the Tensile Strength of Wounds in Animals, *Surg., Gynec. & Obst.* **75**: 1-7 (July) 1942.

41. Howard, J. E.; Parson, W., and Bigham, R. S., Jr.: Studies on Patients Convalescent from Fracture: III. The Urinary Excretion of Calcium and Phosphorus, *Bull. Johns Hopkins Hosp.* **77**: 291-313 (Oct.) 1945.

42. Ward, A. A., Jr., and Kennard, M. A.: Effect of Cholinergic Drugs on Recovery of Function Following Lesions of the Central Nervous System in Monkeys, *Yale J. Biol. & Med.* **15**: 189-228 (Dec.) 1942.

43. (a) Howard,<sup>41</sup> (b) Freeman, L. W.: The Metabolism of Calcium in Patients with Spinal Cord Injuries, *Ann. Surg.* **129**: 177-184 (Feb.) 1949. (c) Flocks, R. H.: The Preventive Treatment of Calcium Urolithiasis: The Important Role of Early and Frequent Roentgenographic Examination, *Clinics* **3**: 103-132 (June) 1944. (d) Dietrick, J. E.; Whedon, G. E.; Shorr, E., and others: Effects of Immobilization upon Various Metabolic and Physiologic Functions of Normal Men, *Am. J. Med.* **4**: 3-36 (Jan.) 1948.