Diseases of the newborn : a monographic handbook / by John A. Foote.

DISEASES OF THE NEW-BORN

A MONOGRAPHIC HANDBOOK

BY

JOHN A. FOOTE, M.D.

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INCLUDING CHAPTERS BY

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PRESIDENT AND FACULTY
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IN COMMEMORATION OF THE SEVENTY-
FIFTH ANNIVERSARY OF THE ESTABLISH-
MENT OF THE SCHOOL OF MEDICINE
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PREFACE

MONTAIGNE once wrote, "I have gathered a bouquet of other people's flowers and only the thread that holds them together is my own." This small volume has been literally written around a comprehensive symposium on the new-born child, for the preparation of which the Georgetown University Clinical Society asked the assistance and coöperation of its teaching members over a year ago, and which was later published in *International Clinics*. Many requests were made for copies of the collected papers, so that it was considered worth while to extend their scope, and to add a quantity of new material in order that within the compass of a volume still small enough for ready use, those interested in the new-born child could readily find essential knowledge concerning the ills that beset this uncertain period of life.

Some grammatical purists insist on the use of the term "the newly-born," but usage and custom are excellent guides as to what constitutes proper English, and so the term "new-born" will be used in this work, as of old.

There are many splendid and comprehensive encyclopedic works which cover this period adequately—such as von Reuss' "Diseases of the New-born," or the sections dealing with the new-born in the larger text-books and systems of pediatrics, as well as volumes on special subjects, as Birnbaum's "Deformities of the Fœtus" and Ehrenfest's "Birth Injuries of the Child." To these the seeker after extended information, anthropometric protocols, and physiological data must turn, for this volume is concerned alone with the diagnosis and treatment of the disabilities most com-

monly seen in the new-born, and a few additional facts relative to the alarmingly high death rate during the first weeks of life, which has been little affected by our notable progress in other fields of infant hygiene endeavor. Over thirty-five per cent of our total infant mortality occurs within the first two weeks of life, and it is estimated that in 1921 in the United States over 85,000 new-born infants died within two weeks after birth. Such statistics are, after all, our best apology for issuing a small and elementary work on the child at this period of life.

Adequate bibliographical notes have been provided for those who wish to do further reading. Most of the illustrations are original; a few which have been reprinted from publications of the J. B. Lippincott Company, with sources duly indicated.

The chapter on "Intracranial Hemorrhage" appeared in the *Southern Medical Journal.* The article on "Birth Injury, Deformity and Hemorrhage" is based on material originally published in the *Journal of the American Medical Association.* "Habits in the New-born" contains ideas embodied in two papers which I wrote for "Mother and Child." I am deeply indebted to the publishers of the periodicals named for their permission to utilize this material, and I am equally grateful to my colleagues for their helpful coöperation in preparing the separate monographs included in this book.

JOHN A. FOOTE.

WASHINGTON, D. C.
JANUARY, 1926

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CHAPTER I

INJURIES AND ACCIDENTS IN THE NEW-BORN

By WILLIAM F. O'DONNELL, M.D.
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HAVING in mind the fact that the primary aim of ideal obstetrics is the birth of a normal baby, a consideration of some of the injuries which may occur during its passage through the birth canal is of unquestionable importance.

ASPHYXIA

The greatest danger which besets the baby on its way into the world is the interruption of its respiratory function. It is born usually with a degree of asphyxia or anærosis. Physiologically this is produced *in utero* by the contractions of the uterus, which retard slightly the maternal circulation through the placenta, resulting in an increase of carbon dioxide and decrease of oxygen content of the fœtal blood, while the resulting pressure of the advancing head on the floor of the pelvis slows the fœtal pulse and accentuates the general lack of oxygen. After the baby is born two groups of asphyxia are recognized: The *livida* and the *pallida*. Until modern research has substituted accredited etiological information these older purely symptomatic titles will be used.

Asphyxia livida is characterized in brief by the dark-blue appearance of the baby, swollen, congested face, injected conjunctivæ, and deep-blue lips, although the skin around the mouth may be pale. Tonus of the muscles is not lost, the arms are held up, the body fairly rigid, the throat reacts, and external stimulation produces a reflex. The heart and cord pulsate slowly and strongly. (This variety is found more frequently in vertex presentations.) Causes producing this form of asphyxia may be divided into (1) those which directly cut off the supply of oxygen and (2) those which cause compression of the brain. Among the former may be mentioned prolonged and hard labor pains which do not permit of sufficient aëration of the placental site; excessive retraction of the uterus from the body of the child with diminution of the placental site and varying degrees of placental separation (low implantation of the placenta, or placenta prævia, permitting compression of a large portion of the placenta); or of its cord between the presenting part and the pelvic wall; prolapse of the cord; wrapping of the cord around the neck and progressive grave constriction, as the head advances, either of the cord or of the baby's carotids; rupture of the vessels in the placenta or velamentous vessels, producing anæmia from hemorrhage; and deep narcosis of the mother. *After* birth the air passages may be blocked by a tight caul, aspiration of vaginal mucus, fæces, blood, meconium, or the mucus already present in the baby's mouth may be aspirated into the glottis. Œdema of the throat or glottis resulting from a face presentation may produce grave asphyxia.

In *asphyxia pallida* the clinical picture is entirely different. The child is pale and waxy, the lips alone being blue. The body is limp, the extremities are without tonus, jaw dropped, and throat does not react. No efforts at respiration

excepting a weak occasional movement of the jaw. Pulse is weak and either very slow or rapid. Cord is limp and collapsed, the baby looking like a corpse. The absence of muscular tone and loss of reflex excitability are the criteria of this form of asphyxia. This is by far the more grave form, and the more frequently followed by secondary asphyxia. Asphyxia pallida is the form usually following a difficult breech extraction. This is usually considered a more advanced stage of asphyxia. Crothers, however, offers another explanation of the pallida form. He fails to find any physiologic or clinical evidence to suggest that the pallor and collapse known as " white pallor " have the least connection with the supply of oxygen or carbon dioxide to the blood. Claiming that asphyxiated men never become pale and that experimentally no pallor occurs in asphyxiated animals, he shows that exactly the same signs present in " white babies " may be produced by disturbances of pressure near the medulla or by obliteration of the medullary circulation. By a careful study of the spine of new-born still babies he was able to show that the spine may be stretched two inches by a moderate amount of traction, that the lumbar cord is fixed so that the traction would pull the cervical enlargement downward about one-half inch. He reasons that traction in breech extractions, by indirectly pulling the medulla lower into the foramen magnum, aided by the suprapubic pressure on the after-coming head, almost inevitably impacts the medulla. That hemorrhage into the spine, although supposedly rare, also plays an important part, is borne out by Stoltzenburg. She found in seventy-five cases of babies dying of asphyxia, nine cases of gross damage to the vertebral column, intervertebral ligaments ripped, and a profuse hemorrhage into and about the

vertebral canal, covering the upper cord and medulla with clots. In all nine cases this finding was practically constant. An interesting point was that each of these babies had an extended arm, which caused some difficulty in delivery. These facts suggested to Crothers that most of the breech babies born dead are killed by injury or pressure rather than by true asphyxia.

Treatment.—The treatment should be preventive as far as possible, by closely watching the progress of labor and the condition of the child in the first and second stages. Deliver the baby as rapidly as compatible with safety when the fetal pulse indicates circulatory disturbance, and discourage the routine of converting vertex presentations into breech for rapidity, or convenience of the attendant. In asphyxia livida the prognosis is good, primary respirations usually being automatic. After delivery it is important to clear the uppermost air passages before the child takes its first gape. Apply external heat. Brisk slaps on the buttocks or feet may hasten, reflexly, delayed respiration. In pallida, Crothers belittles hot and cold baths, Schultze's manœuvre, etc. *Active* measures should be applied cautiously since in slight intracranial hemorrhage, which is often present, grave injury may result from vigorous manipulations. The logical treatments are those of shock and hemorrhage: (1) Warmth. (2) Lowering the head so that blood may be assisted by gravity to the brain. (3) Efforts to restore the stagnant blood in the splanchnic area by suitable abdominal binders. (4) Adequate artificial respirations. (5) Efforts to excite the medulla. Due to its pathology (medullary hemorrhage and impaction), the mortality of the pallida must necessarily be high.

Injury to the Blood Vascular System

Next in importance are injuries to the blood vascular system resulting in hemorrhage. The most important of these are the intracranial hemorrhages. In common with the other varieties of visceral hemorrhages, intracranial hemorrhages occur most frequently in large children and following difficult labors, *but may occur in normal easy births due to pathological conditions present in the blood or their vessels.* Evidences of hemorrhage in the abdomen are not uncommon, but for the most part consist of small hemorrhages on the surface of viscera covered by peritoneum. Large intraperitoneal hemorrhages are rare and are usually from the mesenteric arteries or from the suprarenals. The thorax protects the lungs well from injury so that hemorrhage into the lung is rare. When present the clot, by blocking a bronchus, produces a condition similar to atelectasis. The danger of intraspinal hemorrhage in breech extractions has been touched upon and occurs probably more frequently than one is led to suspect. Subcutaneous hemorrhages are usually present in the presenting part due to pressure of the pelvis or in forcep applications. The most frequent of these are about the face in face presentations, and in the cellular tissue of an extremity when same is prolapsed. In difficult vertex presentations we occasionally get an extravasation of blood under the pericranium due to rupture of some of the small vessels from pressure, the cephalhematomæ.

Symptoms and Treatment.—In large intracranial hemorrhages *asphyxia pallida* may be present. In less rapidly bleeding traumatic intracranial hemorrhages, cyanosis of an intermittent type with tonic convulsions of the limbs and

Cheyne-Stokes type of respiration appear soon after birth. If the hemorrhage is above the tentorium cerebelli, bulging of the fontanelle is observed, and the spinal fluid may show little or no blood. If the bleeding is below the tentorium, the fontanelle does not bulge, but the head may be retracted and blood is abundant in the spinal fluid. The bleeding tendency and the influence of this on intracranial hemorrhage will be considered elsewhere.

Of the local hemorrhages cephalhematomæ may be mistaken for hernia cerebri. The fact that the latter *never* occur over the region of the fontanelles is of help in differential diagnosis. These swellings are also not elastic, and do not pulsate or bulge when the infant cries, as do brain protrusions. No treatment is usually the best treatment, at least for many weeks. Small hemorrhages in the abdominal cavity give no symptoms, and no treatment is indicated. The severe forms produce sudden collapse and death. Treatment is unavailing. Severe spinal hemorrhage usually produces death. Milder hemorrhage may produce no symptoms, or later evidences of paralysis, the exact distribution of which depends upon the part of cord involved. Subcutaneous hemorrhage and cephalhematomæ tend to resolve, and the application of heat and massage may facilitate absorption.

Injuries to the Nervous System

Cerebral paralysis is the late result of central hemorrhage, the earlier symptoms and signs of which have just been enumerated. Unlike spinal paralysis, it is at first of a *tonic* type, and flaccidity is almost unknown at this time. It is the most common type of birth palsy. Spinal paralysis is extremely rare, as the most frequent site is in the cervical cord and produces death. Among peripheral nerve injuries

the most frequent are those to the branches of the facial (Fig. 1), and either hemorrhage or avulsion of the cervical root, or pressure on the brachial plexus. Erb's paralysis is due to injury of the fifth or sixth motor root of the brachial plexus usually by traction in delivering the after-coming head. Peripheral paralysis of the lower extremity is rare and is the result of some grave error in obstetrical judgment. These injuries are due to traction on presenting parts, as the arm and shoulder, or the after-coming head.

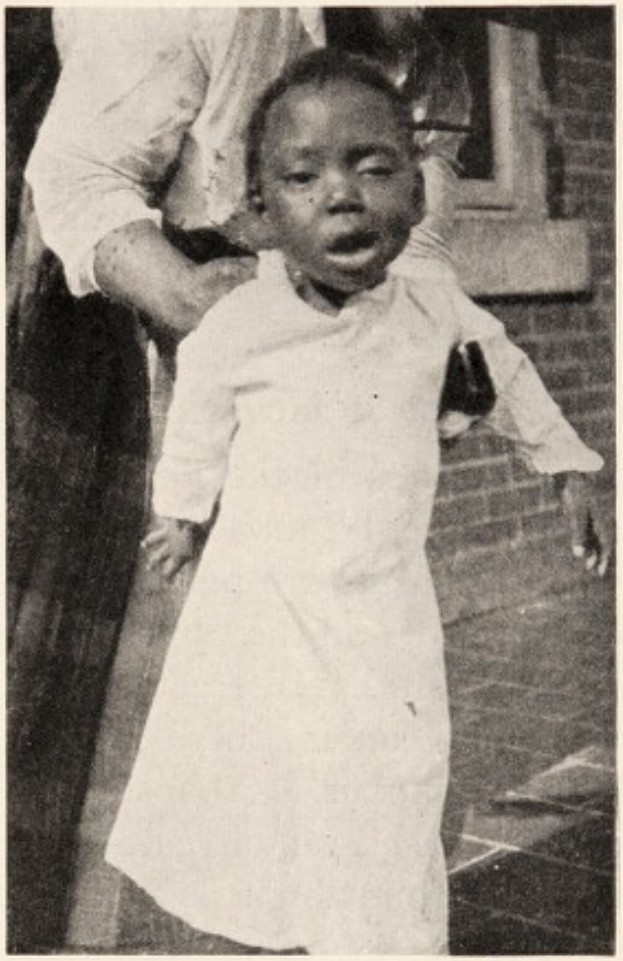

FIG. 1.—A persisting facial palsy. (Photograph by Dr. John Foote.)

Symptoms and Treatment.—In general when the paralysis is due to hemorrhage the repair is slow but often complete. The typical spastic paralysis following intracranial hemorrhage and affecting one or more limbs and sometimes involving the trunk muscles, known as Little's disease, is a typical upper motor neurone lesion which appears later in life.* All of the neuromuscular reflexes are exaggerated in the affected portion of the body. In complete section of peripheral nerve branches from birth trauma the prognosis

* As Little included spastic paraplegia among the symptoms in his original publications, the modern effort to limit the term Little's disease to agenetic disorders of the motor tracts due to prematurity is essentially wrong.

is grave as to return of function unless the nerve ends be found and sutured. In facial paralysis, the injury is usually produced by the blade of the forceps close to the exit of the nerve from the stylohyoid foramen. The face is drawn to the opposite side, with inability to close the affected eye, and often difficulty in nursing. The prognosis is good. After several months the paralysis usually clears. In Erb's paralysis the arm is rotated inwards, the thumb pointing backward. Sensation is usually not interfered with, while the muscular atrophy is rapid.

Fractures and Other Injuries

Fractures of the long bones and epiphyseal separation occur more frequently in breech extractions, particularly when the arms are permitted to extend. The clavicle in its outer third, and the upper end of the humerus, are the most frequent sites. In fractures of the clavicle the prognosis is very good unless there is an accompanying injury to the brachial plexus. Almost any obstetrical manœuvre may cause a fracture. Fracture of the humerus has been seen (Fig. 2) following a hasty delivery during Cæsarean section.

Treatment.—For fractures of the clavicle a pad in the axilla, and fixing the arm in a slightly raised position with the shoulder drawn and held back is all that is necessary. Adhesive plaster makes an excellent dressing for the young infant. The "Z. O." plaster is least irritating to the tender skin of the new-born. For fracture of the humerus, a plaster cast is usually necessary. Fracture of the spine often results in death. Fracture of the skull may occasionally be produced by pressure of forceps, or a spoon-shaped depression without fracture may be produced by an abnormally prominent sacrum. The treatment of such depressions

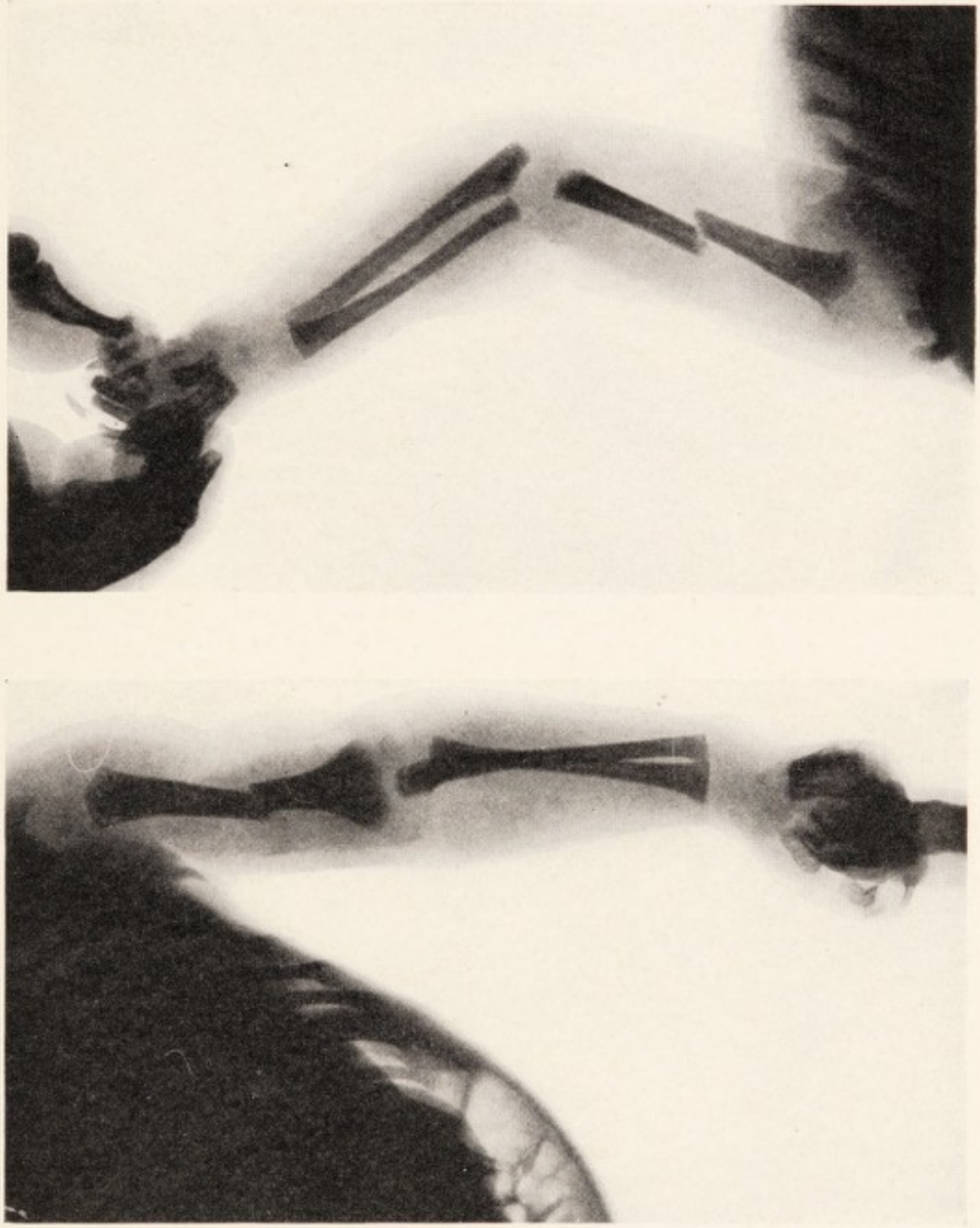

FIG. 2.—Fracture of the humerus in the new-born.

is expectant. Fractures of long bones are treated in the hospital by extension, with the infant lying on a Bradford bed.

Fig. 3.—Double cephalhematoma, one week old.

Other injuries to be mentioned are rupture of muscles, particularly the sternomastoid by forcible extension of the head, lacerations of scalp, scrotum, rectum or vagina by mistaking the presenting part, laceration of an ear, injury or destruction of an eye, fracture or dislocation of jaw, contusions of cheek or neck. Our newer knowledge of the frequency of occurrence and influence of the hemorrhagic tendency in complicating minor injuries in the new-born should be kept strongly to the fore.

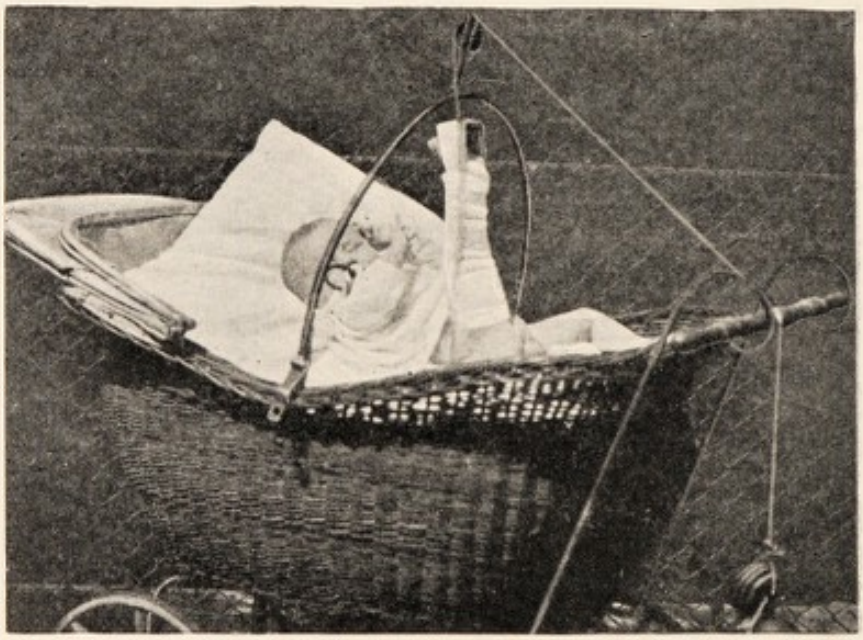

Fig. 4.—Extension and counterextension in fracture of the femur. (Spitzy, in Pfaundler and Schlossmann.)

Congenital Deformities

While deformities cannot strictly be classed as injuries, yet certain deformities are believed to be caused in intra-uter-

ine life by traumatic pressure of adhesive bands or similar injuries. (Fig. 4.) Amputation of limbs and various pressure phenomena are sometimes explained in this manner, as well as

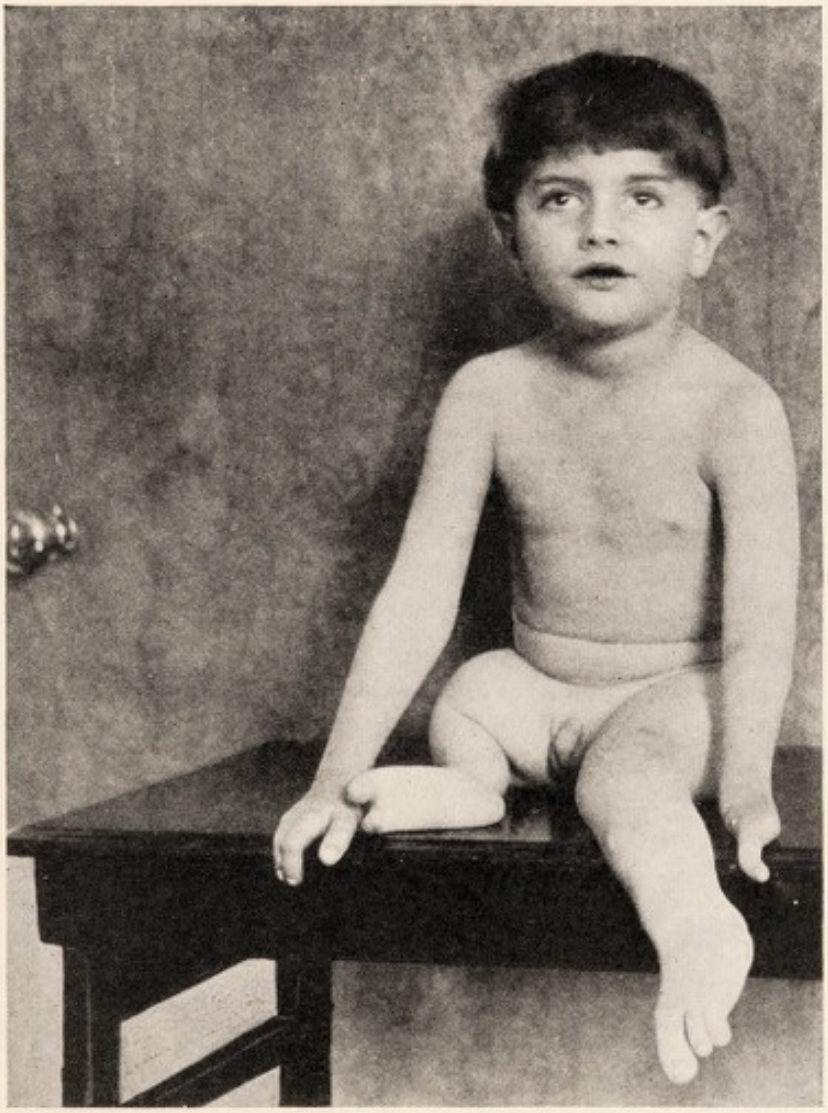

FIG. 5.—Congenital deformity of extremities. Undeveloped right leg with three-toed feet. Webbed three-fingered right hand and one-fingered left hand. Children's Hospital, Washington, D. C.

monstrosities of various kinds. Congenitally deformed children, by their very deformities, may be difficult to deliver, and may suffer as a result from birth injuries. These should be treated according to the routine employed in the normal child. An abundant literature gives adequate information to those

interested in the subject of congenital deformities, and a number of references are appended, including an old but excellent manual of special surgery.

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CHAPTER II

INTRACRANIAL HEMORRHAGE IN THE NEW-BORN

By JOHN A. FOOTE

It has long been known that bleeding within the new-born infant's skull may be, and often is, caused by the mechanical trauma of protracted labor, and it has also long been recognized that severe hemorrhage may occur after the use of forceps, after extraction, and after other obstetrical operations and manœuvres. Many still-births following such procedures are believed to be due to intracranial hemorrhage. McNutt in this country, and Little, Wehe, Kundrat and others abroad have described the pathology of these injuries attributed to the efforts of the mother to give birth to the infant, or to the assistance furnished such efforts by the obstetrician.

In 1911, Schloss and Commiskey reported the successful treatment of spontaneous hemorrhage in the new-born by the injection of human blood. In 1916, Green found that some children with intracranial hemorrhage also showed evidence of spontaneous hemorrhage elsewhere and called attention to the connection between these two conditions. In 1918, following clinical observations covering three years, I concluded and stated that: "All the causes are not maternal. . . . There is a hemorrhagic tendency in the new-born infant which does produce after-labor symptoms of hemorrhage of the brain," and I advocated at that time the injection of human blood or thromboplastin as a remedy. The following year Warwick

reported the discovery at autopsy of intracranial hemorrhages in about 50 per cent of 36 new-born and still-born infants, and not long afterward I reported eight clinical cases with two fatalities which I treated by hemostatic therapy. Rodda, in 1920, made a study of the coagulation time in nine new-born infants who showed symptoms of intracranial hemorrhages and were treated by subcutaneous injections of blood.

As many infants in Warwick's and Foote's and Rodda's series were delivered spontaneously, it began to be appreciated that the use of forceps or operative treatment was far from the only important cause of intracranial hemorrhage in the new-born, and that a large number of such hemorrhages were due to ordinarily minor injuries to the infant's meninges during the course of normal or rapid labor which assumed pathological importance because many of these infants were potential or actual " bleeders."

That the tendency to bleed is found in very many otherwise normal infants during the first few days of life, and that this tendency resembles the condition found in purpura, and is characterized by a diminished thrombin content in the blood, was later brought out by Lucas and other workers. The injection of adult blood, or other substances rich in thrombin, which had been employed clinically, was now given a logical physiological basis in the laboratory.

Since 1920, an extensive literature has grown up concerning this condition and its treatment, and gradually its great importance as a cause of death in the first week of life has begun to be more and more understood and appreciated by the general medical profession.

Diagnosis of Intracranial Hemorrhage of the New-born

History.—The history of the labor may sometimes allow the obstetrician to anticipate hemorrhage, although it frequently occurs after ordinary normal delivery. Generally speaking, cerebral hemorrhage may be watched for: (1) after very rapid delivery, especially of premature infants; (2) after breech delivery, especially following version or difficult extraction; (3) after protracted labor, especially accompanied by instrumental delivery; and (4) when spontaneous hemorrhage is seen.

Clinical Types of Intracranial Hemorrhage.—Two main clinical groups may be distinguished.

(a) The *rapid traumatic type,* long known and recognized, due mainly to the rupture of a large vessel or vessels in which the symptoms appear very soon after delivery, and in which the presence of the hemorrhagic tendency plays a minor rôle; and (b) *the slow spontaneous hemorrhagic type,* due to an injury of minor degree which has been made dangerous through the innate tendency to bleed.

Intermediary types are found, and here belong those infants in whom asphyxia is at least a predisposing cause.

Very little can be done in the way of curative medical treatment of the extensive and rapid type of these hemorrhages, but the slower hemorrhages show a very promising field for therapy.

Symptoms and Treatment

Massive Hemorrhages.—The rapidly bleeding infant shows his symptoms promptly after delivery. He is blue, breathes with difficulty, develops tremors of the arms or legs

within a few hours and may die within a short time after birth. Rarely does recovery take place in extreme cases, and when it does, Little's disease is its sequel. The treatment does not differ from that used in the latent or slower type, and includes lumbar puncture, transfusion or the use of coagulants subcutaneously, all done with the greatest possible rapidity. To prevent permanent paralysis surgery should be resorted to within a week provided coagulation time has become normal. The general management in other respects should correspond to that employed in the slower form of hemorrhage. In such infants, coagulation tests may be done, but are not of the same importance at first as in cases where delayed bleeding occurs.

The Delayed Hemorrhages.—In this, the most frequently found type, symptoms do not occur until focal pressure has developed within the skull. As the infant's skull is capacious, slow bleeding usually goes on for 48 to 72 hours before signs are visible. At birth these infants may appear perfectly normal. The earliest single symptom is perhaps disinclination to nurse. In 18 cases of the delayed type which I have seen in consultation practice during the past three years, 12 gave a history of disinclination or refusal to nurse on the second day. Such infants may begin to suck vigorously within the first 24 hours and nurse poorly or not at all afterwards. In hemorrhage below the tentorium cerebelli I have noticed that the infant frequently protrudes his tongue to an abnormal degree. This is also an early symptom, but not an invariable one, and is perhaps due to the irritation of the hypoglossal nerve. Cyanosis is among the first symptoms noticed, and is the most constant. Frequently this is attributed to congenital heart disease, the much spoken of patent foramen ovale, though congenital heart disease is relatively

infrequent in routine autopsies, as compared with intracranial hemorrhage. The cyanosis is not permanent. It is intermittent and comes at varying intervals. At the same time, tonic twitching of one or more limbs is observed, most frequently of the arms. When the hemorrhage is below the tentorium, the cyanosis is early and marked. When the hemorrhage is in the region of the hemispheres, cyanosis comes rather later. In hemispheric hemorrhage, retraction of the head is usually not present, and the fontanelle usually is firm and bulging. In the infratentorial type, the fontanelle does not bulge early, and retraction of the head is frequent.

Localization of the site of the hemorrhage is for various reasons far more difficult in infancy than in adult life. Usually, however, the facial and other cranial nerves when affected show paralysis of a bilateral type when hemorrhage is infratentorial, and of a unilateral type when it is hemispherical.

Interpretations of eye symptoms and reflex findings are apt to be misleading. Usually when paralysis occurs it is preceded by a tonic or irritative period in the muscles affected, tonic convulsions preceding flaccidity. Flaccid paralysis is indeed found only late and after large cerebral hemorrhages, or after injuries to the cord.

To sum up then: in the first 24 hours, after rapid or forced delivery, or even after normal labor, irritability or extreme lethargy, disinclination to nurse, protrusion of the tongue; in the second 24 hours tenseness of fontanelle, spastic twitching of limbs, intermittent cyanosis or paleness, all point to a progressive hemorrhage within the infant's skull. As before stated, a large number of these infants have a diminished coagulability of the blood, which may be considered among the symptoms.

Blood Coagulation.—In the succulent tissues of the infant ordinary methods of obtaining blood give a false picture because of the large amount of thrombin liberated by the cut. Rodda devised a method which was intended to avoid this error by using a large incision and not manipulating the wound, and using several drops of blood. Lucas and co-workers do not favor any operation involving a stab wound, and advise the use of blood from the fontanelle drawn in a syringe and placed in small test tubes, a procedure not to be taken lightly. Many clinicians, when the technique is not standardized, are content to make a stab wound in the heel, gently wipe away the blood and note the length of time required for bleeding to stop. Two to five minutes is normal. This is a rough but available method, devised by Duke, for bedside use, but should not be relied on as an absolute criterion. For further discussion see pages 63 and 166.

Lumbar Puncture.—As a diagnostic procedure lumbar puncture is of considerable value provided it is skilfully done. When the hemorrhage is infratentorial it has also therapeutic value, as has been pointed out by Brady. In the very young this procedure is neither simple nor easy of performance. Puncture of the vertebral veins and contamination of the spinal fluid with bright blood is a frequent occurrence. Old, clotted blood is often seen in infratentorial hemorrhages. In cortical hemorrhages of some days' standing the color may be a somewhat deeper yellow or may be unchanged. Absence of macroscopic blood in the spinal fluid may therefore be of little significance. Presence of bright, unclotted blood usually means faulty technique. In the microscopic examination the finding of deformed red blood cells, even though few in number, is significant.

Complications

Fever is usually not present in slowly progressing hemorrhage. In severe injuries, fever of central origin may occur. In infants who refuse to suck, or who take little liquid, inanition fever may develop. A not infrequent occurrence is bleeding from mucous surfaces, the throat, stomach, nose and rectum. Out of 18 cases I have found three of this type, which were seen on the fourth day after birth. Persistent vomiting is not a usual complication, but was found in one fatal case. Spinal cord injury is shown by flaccid paralysis of a bilateral type.

Treatment

General Methods.—Too little attention is paid to the nursing care of these infants. It is well to remember that the primary aid of all treatment is to favor blood coagulation. The frequent handling of the infant for the purpose of changing or dressing or undressing him, is a positive menace to his life, and would not be permitted in any other form of internal hemorrhage. The infant needs little more about him than a diaper and one or more blankets, and this simple garb should be insisted upon. Infants' clothes as now constituted are an absurd imitation of older people's clothing. The infant should be placed in a basket, or small crib, where diapers may be changed without change of the patient's position. The body should be kept warm. An ice bag wrapped in towels, so as to be cool rather than cold, should be kept at the head. No direct nursing should be allowed, or violent sucking. The mother's breasts should be milked, or expressed, and the milk given to the infant by means of a Breck feeder or a large medicine dropper. This routine should be observed until the end of the first week or ten days. In cases where umbilical

infection is present it should be continued even longer. As Lucas has shown, infection increases the amount of antithrombin in the blood and favors bleeding.

Specific Treatment.—The injection of blood or other substances rich in thrombin should be employed in every intracranial hemorrhage. As a prophylactic measure after very rapid, or very prolonged instrumental delivery, an injection of 20 cc. of whole blood under the skin or intraperitoneally will often be of the greatest benefit to the infant. When the symptoms of blueness or twitching have appeared no time should be lost. Fifty cc. of citrated blood drawn from the father should be immediately used hypodermically or intraperitoneally and repeated every six hours for at least three injections. If no blood is immediately available Fibrogen (Merrill) 1 cc., or Squibbs thromboplastin, 10 cc., should be given subcutaneously. Horse serum is of less value, though if very fresh may be beneficial. Usually blood can be obtained without difficulty. The use of citrated or even unmodified blood injected into the peritoneum has been recommended in other conditions. I first used whole blood uncitrated in one case of general hemorrhagic disease with intracranial symptoms and citrated blood intraperitoneally in another case, with most happy results. Both infants showed cyanosis, spastic paralysis of the right arm and blood in the stools. Twenty cc. were injected into the peritoneal cavity and 10 cc. subcutaneously. The improvement was immediate. Transfusion in this manner or through the fontanelle is sometimes life-saving when the infant has lost much blood. It must be recalled that the loss of two ounces of blood in the five-pound infant is more than equivalent to the loss of one-half a gallon of blood in a 160-pound man. I now use as a routine method 50 cc. of blood with 10 per cent of 4.1 per cent solution of

citrate of soda given by injection into the peritoneum. Whenever possible the blood is matched before transfusion.

The subcutaneous or intraperitoneal injection should be repeated every six to eight hours if needed. If fever is present, plenty of fluid should be given by mouth, including an abundance of breast milk. In hyperpyrexia, the infant may be carefully wrapped in a bath towel, wrung out in warm water, for one-half an hour or more.

At the end of 48 hours this treatment should be effective. Continued rest should be given for from seven to ten days. Not before that time should the infant be allowed to nurse the breast directly.

Prognosis

The prognosis as to life is usually good in the slowly developing type, provided diagnosis is made early and proper treatment employed. The same is true as regards sequelæ. Frequently, the most desperately ill patients recover with little or no paralysis. In the subtentorial type, if primary respiratory paralysis is avoided, the resulting motor paralysis is usually either mild in extent or absent. Evidence is accumulating to indicate that this is by far the most frequent type of trauma in the new-born. In two of my severe cases, one is well at the age of three, the other has a slightly spastic condition of one foot. The general mortality of 30 cases of varying degree of hemorrhage seen in consultation early and late has been about 40 per cent.

This gives hope that skill in delivery, avoidance of rough methods of extraction and rough methods of artificial respiration, such as Schultze's manœuvre, as well as prophylactic injections of blood and early diagnosis and treatment, may all serve to prevent or render negligible the heavy toll now levied on the new-born by intracranial hemorrhage.

The obstetrician must remember that intracranial hemorrhage is the most frequent cause of cyanosis in the new-born, and congenital heart disease one of the most infrequent, and that intracranial hemorrhage should always be suspected when cyanosis is present. The pernicious doctrine, still found in some text-books on obstetrics, that traction on the after-coming head and similar procedures rarely harm the infant, must also undergo complete revision. All very rapid, or premature, or arduous labors, or even seemingly normal labor, may play a part in producing intracranial hemorrhage.

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CHAPTER III

CARE OF THE NEW-BORN CHILD

By JAMES M. MOSER, M.D.

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WHEN the last torturing pain accomplishes its purpose and the cord is tied the accoucheur, watching the infant borne away in a blanket, washes his hands and departs, breathing sighs of relief that his work is done. But it is in truth just begun. He has the responsibility of a new life upon his shoulders, a life whose future depends greatly upon the intelligence and skill of its attendants during the first few days and weeks after birth. This is the critical period of life, and the one most lightly treated.

Immediate warmth after birth is absolutely essential, and the physician should see to it that warm blankets and hot-water bottles are in readiness and properly placed. The temperature of the room should be kept between 80° and 85° F. for safety. The infant's body temperature should be taken at frequent intervals and maintained at proper levels (98° to 100°) by hot-water bottles if there is any tendency to the sub-normal. Extreme precautions should be taken against sudden chilling and all unnecessary handling forbidden, especially of premature and delicate infants. In this connection a note of warning should be sounded against the practice of allowing young infants to be taken out of doors in the first few weeks of life, especially during cold weather. It is a safe rule to keep these babies indoors for one month during warm weather and two to three months during the winter season.

And yet the writer has frequently seen half-frozen infants of several weeks of age out in freezing weather, and has been told by the mother that her obstetrician advised her to do so. Surely the fresh-air craze can be overdone.

Resuscitation

If measures for resuscitation become necessary they should be employed with caution and gentleness. In the milder forms of asphyxia simple flagellation, spanking, or the alternate use of hot and cold baths will suffice in the majority of cases. In severe forms, however, these are ineffectual and more strenuous manœuvres are called for. In the writer's opinion Shultze's method of swinging the infant in the air is nothing short of barbarous and extremely dangerous and should not be employed in any case. The simple methods of Dew and Sylvester and Laborde are efficient and may be employed while the infant is kept continuously in the hot bath. Meltzer's method of the continuous insufflation of air is promising but hardly practical for routine use. As a *last* resort direct inflation of the lungs by the mouth-to-mouth method has saved many a life, though advised against by many authors. If a strip of sterile gauze be placed over the infant's mouth during the procedure and forceful breathing limited by the operator, the dangers may be minimized. The writer has frequently seen this method succeed where others have failed. The pulmotor for this purpose has been unsuccessful in the hands of most practitioners. Whatever method is used it is important that the mouth and pharynx be first cleaned out, and that the first movement should be that of expiration in order to expel mucus and other foreign material from the passages. In cases where artificial respiration has been used particularly, and even as a routine in all cases, it is

absolutely vital that the infant be made to cry sufficiently for proper lung expansion during the first few days. For this purpose the writer has found that the very simple method of flicking the soles of the feet with a rubber band will produce highly satisfactory results, and the nurse is instructed to perform this duty at frequent intervals.

Prophylaxis

Immediately after birth the eyes should be cleansed with absorbent cotton and boric acid solution or boiled water, and then two or three drops of 10 per cent solution of argyrol or a 2 per cent solution of silver nitrate instilled into each eye. The silver nitrate should always be used where there is any suspicious vaginal discharge in the mother. These preparations should be *freshly* made for use and their application not repeated unless the eyes are infected. If used too freely or when too old, a non-infective but persistent conjunctival irritation may be set up.

The Bath

The first bath should be given in a warm room, using water at a temperature of 100°. The body should be oiled thoroughly before the bath in order to remove the vernix caseosa. This should be very gently done to prevent dermatitis and abrasions which might permit the entrance of infection.

The Umbilical Cord

The cord should be dressed with a simple sterile dusting powder and wrapped in sterile gauze, after which a flannel band should be applied. At this time a thorough examination should be made for injuries received during delivery and note taken of the condition of circulation, respiration, etc. The

child should then be placed in his crib in a quiet, darkened room. The eyes must be carefully protected from strong light during early infancy. Too much stress cannot be laid upon the importance of keeping the child from being handled by relatives and friends. Many dangerous respiratory infections, etc., have in this way been unnecessarily contracted by the helpless infant. The " No Visitors " sign on the door of mother and infant for at least one month after birth will aid the successful outcome of many a difficult case.

The cord should be kept dry and undisturbed until it falls off. The striking frequency of umbilical hernia in babies points to some glaring and, as yet, undetected error in the present technique of caring for the cord. The routine use of a sterile gauze pad and supporting flannel binder for at least one month after the cord drops off is advisable and should be considered essential. There is too much of a spirit of derision among modern obstetricians regarding the use of this binder. While it is not necessary as a protection to the abdomen it is indispensable to the thorough healing of the umbilical wound when properly applied.

The foreskin of the male infant should be attended to by the physician himself and not left to the care of the nurse or mother during the first weeks of life. Many an unnecessary circumcision has had to be done in later months because of neglect of this matter by the attendant. Adhesions of the clitoris if marked, should also be broken up at an early date.

Breast Milk and Colostrum

Perhaps the most important single factor in the successful care of a new-born infant is maternal nursing. Year after year so many new facts have been brought out by laboratory workers and clinicians pointing toward the great advantages

of breast milk over artificial foods that it has now become almost an unwritten law that no child should be deprived of its natural food except under most unusual circumstances. Human milk is now known to contain vitamins essential to the proper nutrition of the child. There is no doubt that it

FIG. 6.—Malnutrition and atrophy in twins through lack of breast milk and improper feeding. (Photograph by Dr. John Foote.)

also contains immune bodies which protect the infant against certain diseases and strengthen its resistance against all infections. Those who do pædiatrics must have been struck by the remarkable immunity and freedom from serious sequelæ of the breast-milk babies as compared with the artificially fed infants during the recent epidemics of influenza and "grippe" ravaging this country. Even colostrum has come in for its share of study and praise. It is now believed that

colostrum possesses a distinct bacteriolytic action, containing agglutinins which are directly absorbed into the blood of the new-born, thereby conferring upon it an acquired immunity. According to Boyd, the blood of the new-born before ingestion of any food contains relatively small amounts of globulin and negligible quantities of euglobulin. In infants receiving colostrum within a few hours after birth there is a marked and early rise in the total globulin content, while in infants deprived of colostrum the globulin content of the blood-serum remains low. These experiments and clinical observations emphasize anew the importance of colostrum in the nutrition of the new-born. Every effort should be made to have the infant nurse the mother for the first week, even if the milk supply itself cannot be stimulated. (Fig. 6.)

Feeding Management

For the first seventy-two hours the infant should receive two to three ounces of boiled water at four-hour intervals. I do not believe it of any advantage to add sugar to the water during the first days of life; on the contrary it may lead to digestive disturbances. Immediately before the water is given, the infant should be put to the breast and taught to nurse; even if it gets no milk for three days the colostrum may be plentiful. An infant requires one-sixth of its body-weight in milk daily and until the milk becomes abundant the difference must be made up in other fluids. As has been stated before, the writer has never seen a case of inanition fever or physiological icterus in an infant receiving early and sufficient fluids.

For the average case, experience of various clinicians has shown that the three-hour interval for breast nursing and four-hour interval for artificial feeding has produced the best

results. A study of each individual case will decide which is the best interval for that particular baby. The four-hour interval should not be established as a routine measure by hospitals. To follow it rigidly leads in many cases to loss of breast milk by insufficient stimulation, and to failure of a sluggish, lazy baby to take sufficient nourishment in twenty-four hours.

The baby should not be removed from the breast because of the results obtained on chemical analysis of the milk. After all, the infant himself and not the laboratory offers the supreme test as to whether or not the breast milk is of good quality. It is well known that the composition of milk, in all its constituents, varies greatly in the same individual, not only from day to day, but also at different periods of the same nursing.

Toilet of the Breast

It has become a recent fad in some lying-in hospitals to forbid any cleansing of the breast or the baby's mouth by the nurse or mother. Just why there can be no middle ground in this matter is hard to conceive. There has no doubt been serious results attributable to rough washing of breasts before and after nursing but that should not prevent the moderate use of solutions to clean off caked milk and perspiration from breasts and nipples. The dictates of common sense and cleanliness demand it. Neither can there be any danger resulting from gentle cleansing of stale milk curds from the baby's mouth once or twice a day.

The Mother's Diet

Too little attention is paid to the diet of the new-born baby's mother. For centuries our grandmothers have stoutly maintained that certain articles of food pass over in the milk

and produce definite symptoms in the baby. Recently investigators have proved the same thing in a more scientific way, which allows us to accept our grandmother's theory. Shannon finds that egg and veal protein may appear in the milk after their ingestion by nursing mothers. Strong clinical evidence is plentiful that colic, eczema, diarrhœa, "milk crust" and vomiting in breast-fed babies may be due to allergic food reaction of the infant to breast milk. The writer has frequently proved to his own satisfaction that the following articles of food eaten by a nursing mother have caused gastric disturbance in her infant, *viz.*, eggs, green corn, turnips, raw onions, rhubarb, strawberries, grapefruit, and cabbage. Some supervision of a nursing mother's diet should be deemed essential, at least in the earlier weeks of the infant's life. Later he will tolerate about any food ingested by the mother.

Prematurity and its Problem

The premature and exceedingly delicate infant requires very special skill. Under care given the average case these infants would survive but a few weeks at the most. Any child weighing under five pounds should be placed in this class.

The most important problems in the management of these cases are: first, to maintain the proper animal heat; second, to provide nourishment; and third, to prevent infection. Immediately after birth these infants should be well oiled and wrapped in cotton from head to foot, leaving only the face exposed. Instead of a diaper, a pad of gauze and cotton may be made and slipped under the buttocks. He is then wrapped in blankets and placed in a basket with protected sides and containing hot-water bottles. It is extremely important that these infants be not handled; they must be carefully protected from draughts and sudden changes of temperature. No

attempt should be made to bathe them, but the cotton may be changed and the skin freshly oiled every other day. Artificial heat may be provided simply with an electric pad. The *room* temperature should not fall below 85° F. In a small room a portable electric radiator may be found useful in maintaining and regulating the temperature. The *infant's* temperature should be taken every three hours, care being taken not to

FIG. 7.—A premature infant wrapped in gauze and cotton, in basket, with hot-water bottles.

expose the child meanwhile, and continuously kept between 98° and 100° F. by raising or lowering the artificial heat. It should be fed without being removed from the basket until it is able to take the breast.

The question of the need of incubators for the premature infant is an open one. Certainly the excessive heat used a few years ago was injurious. The alleged good results obtained at an exhibition " incubator baby show " at an Eastern resort are said to depend more on breast milk feeding than on incubation. A box 24 inches square and 38 inches long, one end being open, lined with asbestos paper, with an electric light globe inside at the closed end to furnish heat, is a good home-made appliance. A thermometer inside gives the tempera-

ture, which is regulated by shutting the light on or off or raising or lowering a curtain at the open end of the box. The infant, carefully wrapped, is placed in this box, with its head outside, so he will breathe outside air.

Breast milk is absolutely essential in the feeding of these cases. If the infant's own mother cannot supply it, enough can generally be obtained from women in the neighborhood, or friends. It requires at first but a few ounces for the infant's needs. Haste is such an important factor in these cases that it is unwise to delay even one day before giving nourishment, in order to get a Wassermann test, etc. It is the writer's custom to boil all breast milk obtained from other sources, thus making it safe for immediate use. These infants should receive at first equal parts of boiled breast milk and boiled water, the interval and quality depending upon the age and weight. If the breast milk seems unusually rich it may be well at first to let it stand for several hours and skim off some of the cream. Some stronger infants will suck from the bottle, but the majority must be fed with a Breck feeder (Fig. 8), or medicine dropper, or even by gavage. From one-half to two ounces should be given slowly every one to three hours. As the infant gains in strength the dilution is gradually decreased and the amount at each feeding increased until nourishment can be taken directly from the breast.

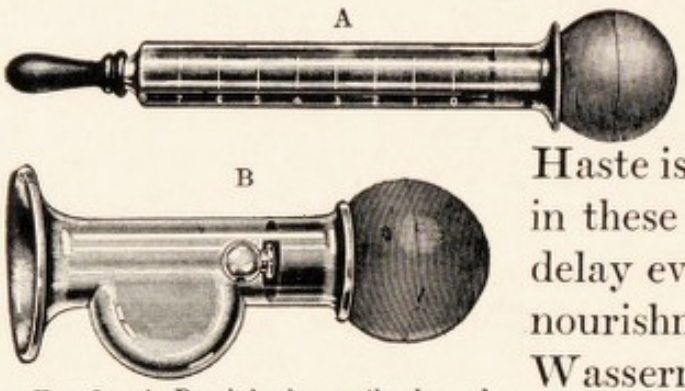

FIG. 8.—A. Breck feeder, easily cleaned, which will take either small or large nipple. B. Improved hand-breast pump. (Beckton, Dickinson Co.)

While the artificial feeding of these infants is almost a hopeless task, the writer has obtained very good results with several substitutes for breast milk and recommends them in

the following order (always bearing in mind that " One baby's food is another baby's poison ") : dried milk-powder mixtures, fat-free whey mixtures, modified goat's milk formulas, and modified skimmed cow's milk formulas.

Many infections in premature infants begin in the upper respiratory tract. No sweeping or dusting should be allowed in the room where the infant lives. Especially, no one with even a mild coryza should be allowed to touch the infant, or even bend over his basket. Droplet infection, or hand-borne infection may well prove fatal. " Words that kill " are a reality when the words carry with them droplets of bacteria into the infant's mouth and nose. It is difficult to make mothers, and especially grandparents, realize this fact, but it is important to emphasize it.

Colicky Infants and Nervous Mothers

Whatever may be the underlying pathological causes of colic, it is certain that it is of gastro-intestinal origin, and that there are two types to be recognized in the breast-fed infant:— fermentative and irritant. The fermentative type is produced by distention from flatulence in the intestinal canal. The irritant type is caused by spasm of the intestinal musculature from undigested or indigestible intestinal contents or allergic food reactions to something in the breast milk.

To be successful in overcoming this frequent and ofttimes persistent condition, treatment must be undertaken in a systematic and painstaking manner.

The only condition of importance from which the cry of colic must be differentiated (aside from syphilis) is that of under-nourishment. It is sometimes almost impossible at first to distinguish between the two. The writer firmly believes that hungry babies have actual pain when in the midst of

"hunger waves" or contractions of the empty stomach, and their agonized cry closely simulates that of colic. They may cry almost continuously day and night between feedings. The stools often are two to five in number, grass green, and may even contain fine curds and mucus; more frequently, however, the movement is hardly more than a greenish stain on the diaper. The temperature is generally slightly sub-normal, the tissue turgor reduced and the skin somewhat pale, with shadows about the eyes. There is of course a stationary or slow gain in weight in the first stages, later a decline in weight. Weighing the infant before and after nursing, if the scales are of the efficient balance type, may give a fair idea of the approximate amount obtained. This, however, often is misleading, and should not be depended upon too much in deciding whether that particular infant is getting enough food. The physician can learn much by making it a point to be present at the nursing and studying his little patient at close quarters during that period. The writer has for some time ascertained in a satisfactory way whether or not an infant is getting anything from the breast by placing the bell of a stethoscope over its throat during the nursing and listening to the swallowing sounds. An infant which sucks one to four times and then swallows is getting a satisfactory supply in a period of five to ten minutes. On the other hand, when he must make from four to eight draws for a swallow he is certainly not getting enough or else the breast is a slow one, and he must be allowed a considerably longer time at it.

The Treatment of Colic

When the diagnosis of colic is definitely made a clear-cut line of treatment should be decided upon and carefully explained to the parents to insure the coöperation and

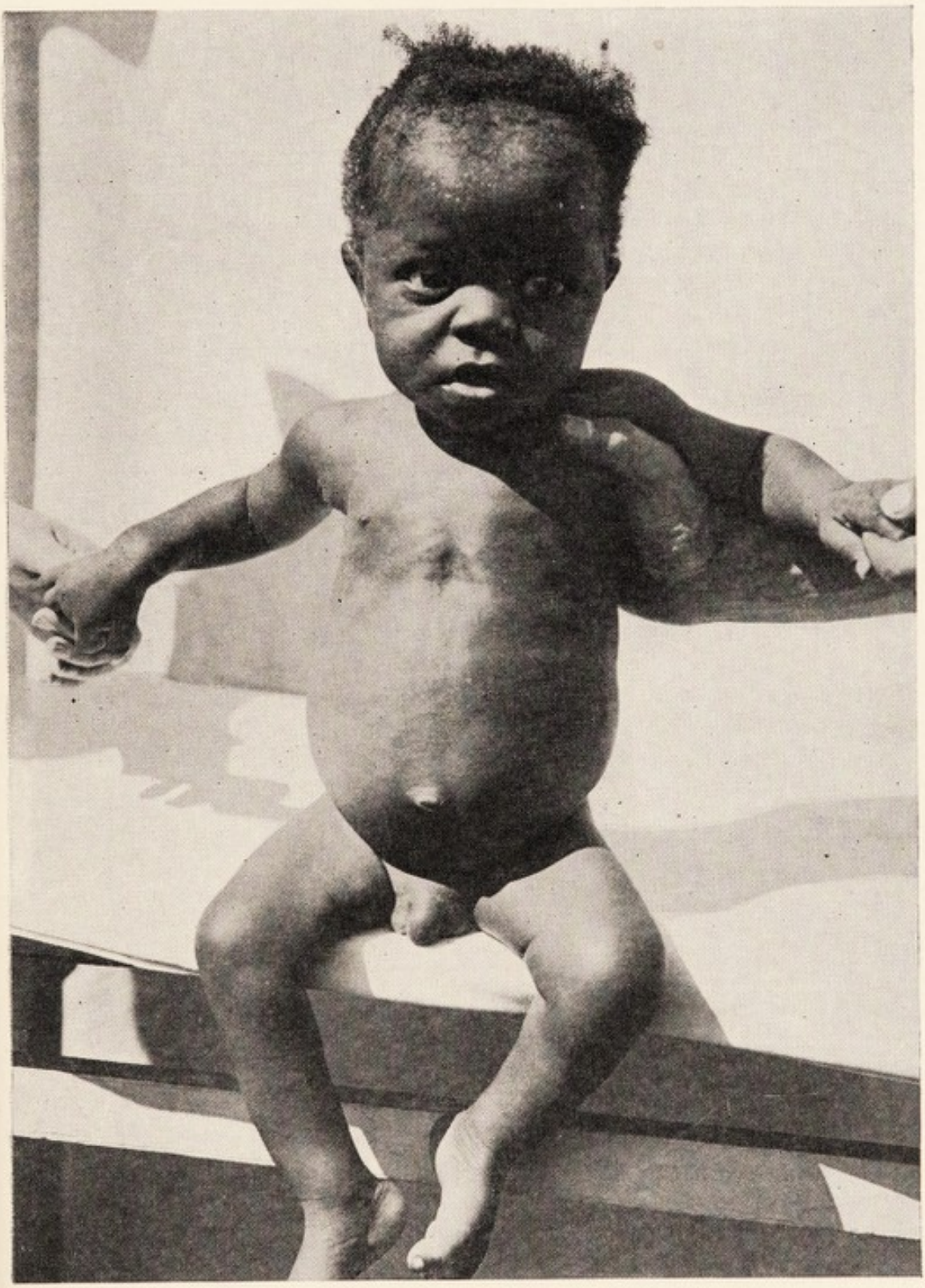

FIG. 9.—Rickets, a common sequel to prematurity (eight months old). Children's Hospital, Washington, D. C.

patience so essential to a successful outcome. The mother's habits, diet, etc., should be regulated. Social engagements must be, for the time, curtailed. A tired-out, harassed, emotionally upset mother will often secrete a colic-producing milk. Constipation in the mother must be overcome with

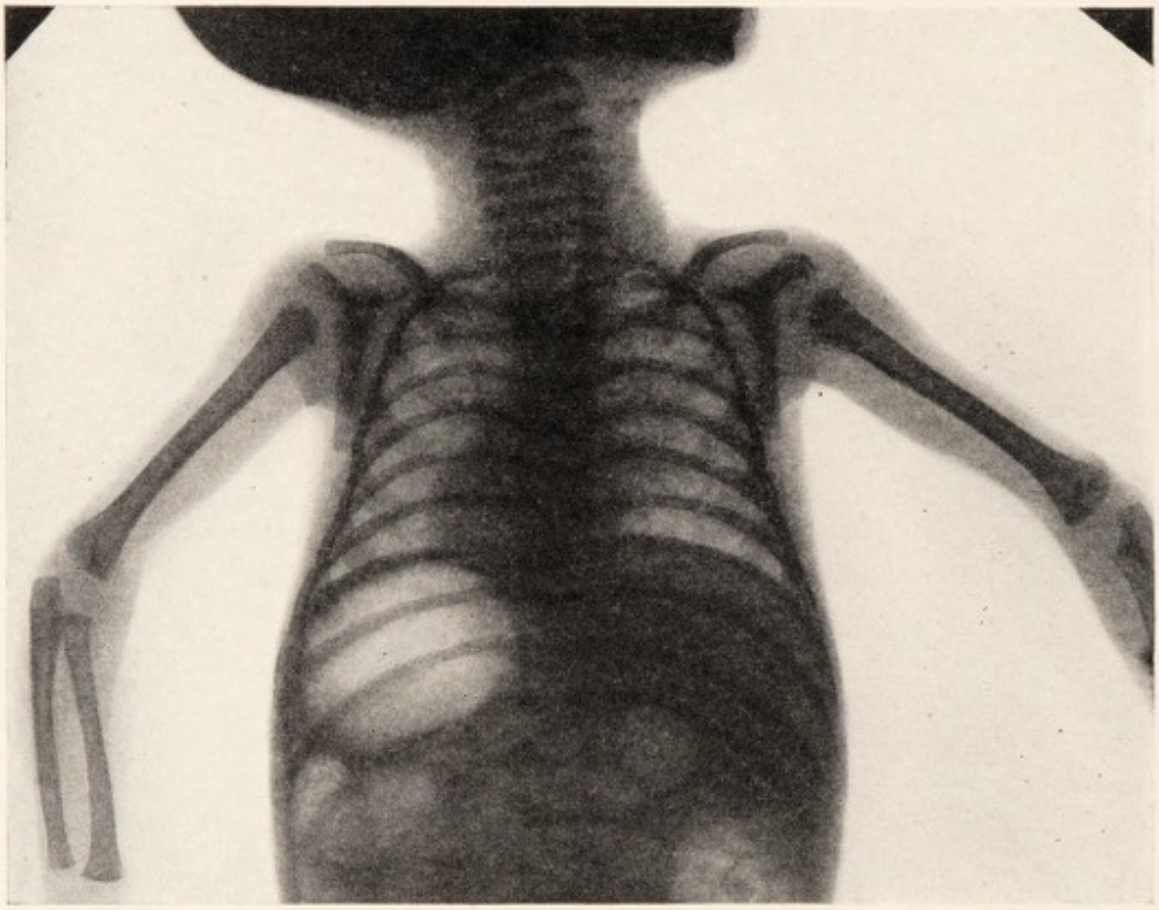

FIG. 10.—The thorax of a three-months-old premature child, showing a slight tendency toward normal angulation of ribs at their junction with the spinæ. Children's Hospital, Washington, D. C.

proper diet, exercise, and, if necessary, mild laxatives. Some of the numerous preparations of mineral oil and agar-agar are to be preferred, inasmuch as laxatives taken by the mother may sometimes pass over in the milk and cause griping pains in her infant.

Lengthening the interval of nursing to four hours and reducing the time at the breast to five minutes, or even three

minutes in severe cases, is often successful. Later when the symptoms improve, the nursing period should be increased slowly to the point of tolerance. The remaining milk in the breast must be pumped out or expressed to insure sufficient stimulation.

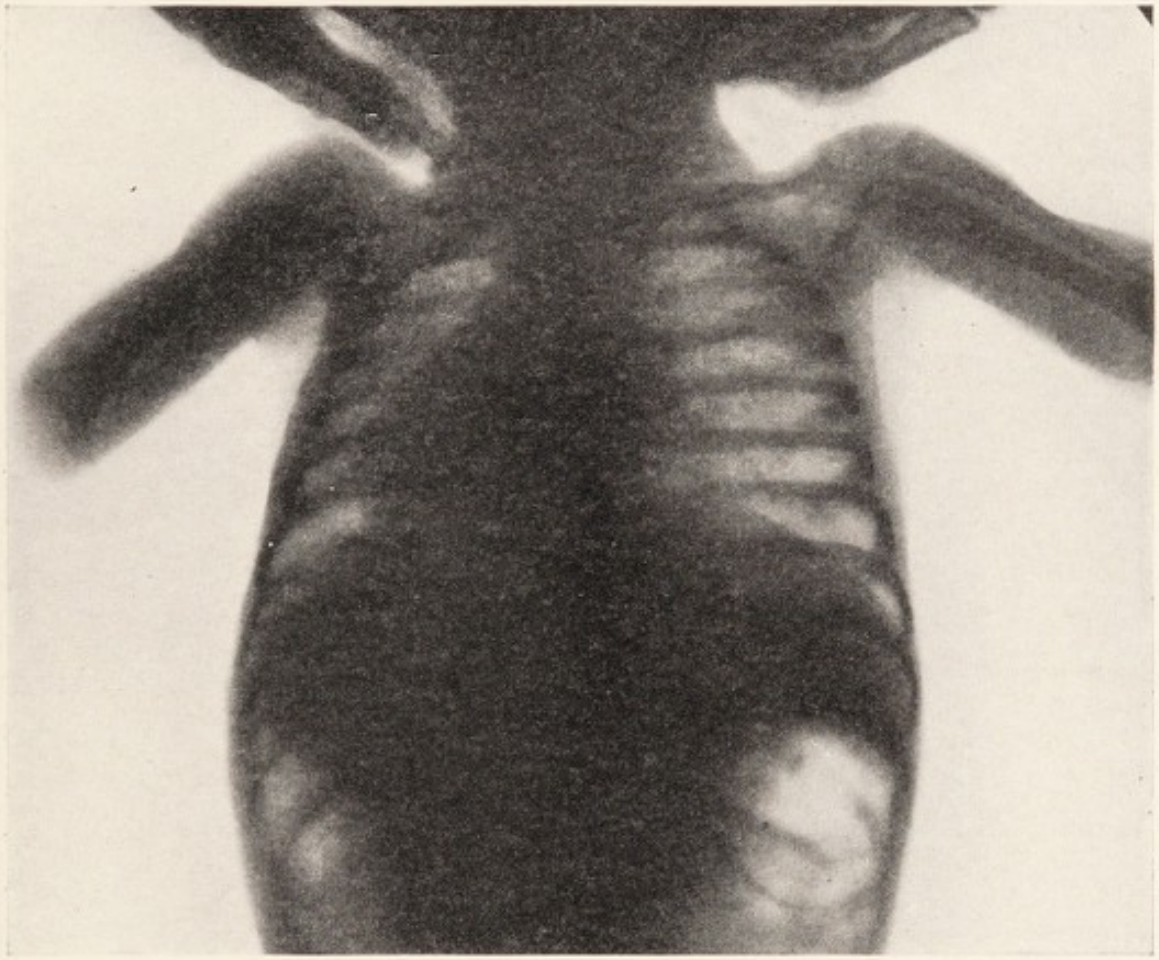

FIG. 11.—The thorax of an eight-months-old child suffering from rickets of moderate degree. Note that the ribs come off from the spine at a right angle as in the new-born.

If these methods fail, it frequently helps to give the infant from one-half to two ounces of boiled water immediately before nursing. This serves to dilute the milk in the stomach and at the same time takes the edge off the usual ravenous appetite of these babies. It seems especially beneficial in infants which vomit a great deal. Lately casein and lactic acid preparations have been recommended to be given in the same manner with

the purpose of overcoming excessive fermentation in the intestines. Probably the most convenient and easily obtained of these preparations is protein milk powder. One teaspoonful of this to an ounce of tepid water given just before the nursing is the best strength and dosage. The writer especially recommends this preparation in that puzzling type of case where the infant undoubtedly cries from *both hunger* and *colic;* this peculiar condition is not as infrequent as supposed, and occurs when the breast-milk fat is unusually high.

These dietetic measures occasionally must be aided by therapeutic means, particularly in acute cases. Colonic flushings with salt solution or soda solution, low enemata of soap suds containing small amounts of tincture asafœtida or glycerine, massage, hot-water bags, or hot stupes to the abdomen, all have an important place in relieving the attack. In persistent and severe cases which resist these measures the judicious administration of one to five drops of paregoric with ten drops of peppermint water in each administration of plain water or protein milk just before each nursing will take the edge off the pain sufficiently to give the screaming infant and hysterical mother a chance to obtain rest and benefit from the dietetic régime. A few drops of milk of magnesia in the above prescription may be necessary to overcome the constipating effect of the paregoric. Elixir of Luminal, which contains ¼ grain to ℥i has also proven of benefit in hypertonic infants in doses of ½ to 1 teaspoonful.

And finally, there are a certain number of cases which seem to resist all efforts at overcoming the condition. These are neuropathic infants with neurotic mothers, mothers of the highly emotional, querulous, unstable, cigarette-smoking type, whose breasts secrete too much at one feeding and go dry at the next. If the above methods fail in these cases it is

the writer's custom to remove the infant from the breast and away from the mother entirely for twenty-four to forty-eight hours and try substitute feeding, meanwhile pumping the breasts. If, as frequently occurs, the infant is one hundred per cent improved it is weaned immediately, as nothing can be gained by forcing it to suckle a mother whose milk is veritably " poison pap."

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CHAPTER IV

PROBLEMS OF BREAST FEEDING

By JOHN A. FOOTE

The desirability of the natural food for infants is so obvious that it is scarcely necessary to mention it here. The physiology of lactation is fairly well understood, the normal stimulus being the reflex produced by the sucking of the infant. The secretion of the breast depends both in quantity and, to a certain extent also, in quality, on the degree of vigor exercised by the infant and on the duration of the nursing.

The percentage of the last milk nursed is high in fat; of that first nursed, low in fat. The baby that most completely empties the breast receives the richest milk. These facts are clear enough. Not so clear is our understanding of the internal factors which influence the secretion of milk by the mother, especially the question of diet. Still further, the mother may be normal, with normal mammary secretion of the proper quality, the infant may nurse properly and provide proper stimulation, and yet another inharmonious factor may be introduced in the lack of adaptation of the child to its food through some congenital or acquired abnormality.

The technique of proper breast nursing is a well-worn subject, yet an important one. Many a young mother does not know how to nurse her infant. She should be instructed in the art of holding the infant in a comfortable position. She should be told to have the infant fully grasp the nipple, including the areola. The necessity of retracing the parenchyma of the breast so that respiration will not be impaired, should be emphasized.

The interval of nursing is a much discussed question. My personal views favor the three-hour interval for most breast-feeding cases; the two-hour interval and the four-hour interval exceptionally. The washing of the breast is, of course, important. The washing of the infant's mouth before nursing is now as deservedly obsolete as the post-partum administration of uterine douches. Some cases of inability to nurse on the part of the infant are traceable to a traumatic stomatitis produced by this harmful practice.

Failure of Infant to Nurse

Failure of the infant to nurse vigorously from a normal nipple may be due to:

(1) An inflammation of the mouth—some variety of stomatitis.

(2) A cleft palate.

(3) Febrile conditions influencing appetite, as the sepsis of the new born, the inanition fever of Holt, etc.

(4) Slowly progressing cranial hemorrhage (although some infants with this condition suck vigorously).

(5) Weakness of the infant, or an imperfect sucking reflex.

Maternal conditions which may prevent the infant from nursing vigorously are:

(1) Improper nursing technique.

(2) Retracted or undeveloped nipples.

(3) Partial or, what is relatively rare, complete agalactia.

(4) One or both breasts being "slow."

Contraindications to Nursing

The maternal conditions which contraindicate nursing are chronic, wasting and malignant diseases, particularly pulmonary tuberculosis, cardio-renal diseases, pregnancy

and acute infectious diseases. While it has been shown that the milk is frequently germ-free in acute conditions, and while, as Finklestein has suggested, in erysipelas the milk may be withdrawn by the pump and boiled, many do not care to make this experiment. In ordinary infections of brief durations, the breasts may be kept active until convalescence. Sometimes, even when lactation has ceased for several weeks, putting the infant to the breast will restore a normal secretion.

Breast feeding is often discontinued for improper reasons. The presence of green mucus or curds in the stool is frequently taken by the mother as evidence that her milk does not agree with the child; hence bottle feeding is resorted to; yet her milk may be perfectly normal and these stools a result of overfeeding.

When breast abscess occurs it is usually necessary to put the affected breast at rest. Nursing from the normal breast should be continued. The frequent presence of pus and blood in the milk from the infected breast is sufficient reason for discontinuing its use as a food. I know that there may be found excellent authority for the practice of continuing nursing from the injured gland, but my personal views are opposed to it.

"Slow" and "Quick" Breasts

The observer will find that nearly always one breast will differ from the other in functional capacity and ease of nursing. Occasionally a breast will be found which will be very hard to nurse. This incomplete emptying by the infant will eventually cause a lack of secretion. When it is reported that "the baby empties one breast very quickly" and "does not seem to get enough, the milk flows so poorly," the matter

should be investigated. Frequently the opposite condition will be found, that the breast empties with great difficulty and the infant tires. When an infant sleeps at the breast after nursing a very short time, it may point to a slow or difficult milk flow. Weighing the infant before and after nursing each breast, and obtaining the average for several nursings, will shed some light on this situation.

The length of time the infant should remain at the breast is variously estimated. Some breasts will be emptied in six or seven minutes, others will require twenty minutes. A maximum time of twenty minutes is a safe general rule. Only one breast should be nursed at a feeding, excepting when it is established that the breast secretion is scanty and inadequate.

The amount of milk obtained by the nursing baby at different nursings varies within wide limits. At one time only one or two ounces will be taken; at another feeding as much as five or six ounces, and so on. The breasts secrete the maximum amount in the morning, fall to minimum after mid-day and increase toward evening.

Mental Excitement and Breast Secretion

The belief that unusual mental excitement, or even ordinary nervousness, prevents the secretion of milk is old and firmly established. Much has been written about the changes in milk secreted at the menstrual period, and it is believed that while these conditions certainly influence the quality and quantity of milk secretion, they do not cause actual illness in the infant. Bendix found little change in breast milk secreted under these conditions. The quantity was diminished and the fat sometimes increased. Other investigators have

found a protein increase. According to Abt, 50 per cent of nursing women do not menstruate and 43 per cent menstruate during lactation. About 20 per cent of all nursing women have regular periods during lactation. "In a word then," says Abt, "many women menstruate during lactation without producing any effect on the baby—occasionally a nursing infant suffers mild dyspepsia during this period."

"But every practitioner," says Abt, in his splendid monograph, "has observed temporary disturbances in the breast-fed baby when the mother has been subjected to some violent grief, some overpowering emotion, a most fatiguing social function or a night spent in dancing, drinking and dissipation. The effects on the baby are, as a rule, mild and of short duration. They consist of vomiting, diarrhœa, restlessness, colic and possibly a short febrile reaction."

It is quite possible to have changes in the milk at these times of a biological rather than a chemical nature, and so not discoverable in the test tube. I personally believe that the slight *chemical* changes noted are not sufficient to produce actual illness in the infant.

Many are the rules as to the diet of the nursing mother, and there is no more abused individual than the mother who follows the advice of her friends in matters of milk-producing diets.

Diet of the Nursing Mother

Most authorities nowadays agree that the mother should eat almost anything in reason that agrees with her, and nothing that disagrees with her. She should not be obliged to force down distasteful foods because they are "good for her," but her diet should be carefully selected to include

nutritious foods for which she has an appetite. One reason why salads, stringy vegetables, etc., are not advisable in large quantities is because they do not contain much caloric energy. But they may be very useful as appetizers if the patient is fond of them. It is now held that certain food proteins ingested by the mother may cause disturbances in the infant. Isolated clinical observations by Talbot, O'Keefe and others bear this out, while Shannon has made convincing experiments with animals. Moser's observations in the previous chapter are corroborative of this research. The strongly-seasoned foods are bad because they give an unpleasant taste to milk, but all seasoning cannot be dispensed with. Also the practice of flooding the alimentary tract with milk or cocoa, or tea, between meals is harmful. Frequently the appetite is destroyed, insufficient food is eaten at mealtimes, and an actual indigestion is produced. These fluids may be taken at mealtime, instead of water, and the appetite will then not be impaired. Plenty of water should be taken between meals up to a quart a day. A quart of milk, two eggs, meat once a day, cheese once a day, the green vegetables and potatoes, bread and cereals of whole-wheat, or oatmeal, green salads—as lettuce, simple desserts—these are the elements of a proper diet for the nursing mother.

As to the nature of the diet which will make milk rich and nutritious, Engel has made interesting experiments with wet nurses in institutions. He concludes that the feeding of fat, rich foods such as cream, fat meat, etc., to nursing mothers has no influence whatever in increasing the *quality* or *quantity* of the milk and only tends to produce corpulence in the mother. This is contrary to the views of Moll, who believed that the feeding of bacon in lactation increased the milk fat.

Influence of Genital Tract on Milk Secretion

The condition of the genital tract after labor is perhaps one of the most important factors in lactation. The disturbances of the infant, the frequent colic, etc., of the puerperium are frequently due to the abnormal stimuli from the traumatized genital tract of the mother influencing the breast secretion. In any case, when the infant has indigestion, green stools, does not gain weight, and this persists during the first five or six weeks after birth, the mother should be referred to the obstetrician for a complete gynecological examination. The writer has seen more than one case in which slightly-infected granulating perineal wounds, or subinvolution of the uterus, caused serious disturbances in the nursing infant; in fact, where breast secretion has been established and seems normal for a few days, and digestive disturbances in the infant begin to develop, it is as a rule, well to look for some irritative reflex from the genital tract.

Much dependence upon the chemical examination of milk has fallen into deserved disrepute; not only because the milk secreted differs in each breast, in the hour of day, in the period of nursing, but especially because it will be found after eliminating all these variations, that a theoretically abnormal milk will agree perfectly with an infant while a theoretically normal milk will cause disturbances. Perhaps the most valuable, and certainly the most available *single* method of determining the infant's food supply consists in weighing the infant before and after each nursing at different hours of the day for several days and computing the average. This will give the quantity of milk received daily with fair accuracy, and seldom is a low quality important if the quantity is sufficient. The stool examination in connection with the foregoing will be of assistance.

Normal and Abnormal Infants

We will now consider some normal and abnormal aspects of breast feeding.

The normal infant nurses from seven to twenty minutes, strongly and vigorously and sleeps until a short time before nursing time. He has at first several stools a day, light yellow in color, glistening and with a characteristic faint lactic-acid odor. Sometimes a slight regurgitation takes place; occasionally a green stool is seen. These are due to variations in breast secretion and have little significance, unless they persist. When the milk secretion is normal and the infant is normal there should be little deviation from this picture. The infant should sleep well and should cry a little before nursing, but not much at other times. When disturbances occur it is well to ask:

(1) Is the disturbance due to overfeeding?
(2) Is the disturbance due to underfeeding?
(3) Does the fault lie with the infant or with the food?

Symptoms of Overfeeding

When an infant is *overfed,* and this is a very common condition, certain symptoms occur which usually result in the physician being called. But because of the fact that many infants will tolerate large quantities of breast milk without obvious injury and, indeed, with rather remarkable gains in weight, often positive harm has been done before the symptoms become acute. The usual history tells of rather unusual gains in weight, accompanied by regurgitation and somewhat frequent stools. Next, vomiting is noted, the infant becomes restless and perhaps loses in weight. Flatulence and colic come at this time, but the stools do not show anything

abnormal excepting some white fat curds. The stools now increase in number and the infant is chafed at the buttocks. The stools are either green when passed, or become green on standing a short time. They contain mucus and typical masses of fat soap curds.

The infant may appear drowsy at times, but is usually very irritable. The healthy pink color and firm tissue turgor is replaced by a pallid skin and flabby tissues. The abdomen is usually tympanitic and volumes of flatus are expelled, following severe attacks of colic. If the overfeeding is continued, the picture changes to one of acute food intoxication, with fever and typical diarrhœa.

The treatment of overfeeding is very simple. The food should be reduced in quantity. Usually this is best accomplished by increasing the interval between feedings and limiting the time at the breast. If an infant has been nursed every three hours for twenty minutes, insist that he be nursed only every four hours for ten minutes. Often it will be found that the mother, interpreting the dyspeptic cry for one of hunger, has nursed him very frequently and for long periods.

If the fat content of the milk is too high, the comparative disuse of the breasts will automatically reduce its percentage. Exercise and a suitable diet will also help. But, unfortunately, abnormally rich milk is often found in the first few weeks of the infant's life, when the mother is unable to take exercise.

The Underfed Infant

Underfeeding is not at all uncommon. While absolute absence of breast secretion is rare, relative absence, or hypogalactia, according to Abt, is found in thirteen per cent of all cases. When normal functioning of the mammary

glands does not occur within four or five days it is easy enough to predict underfeeding in the infant. Usually under these conditions attempts to nurse the infant at the breast are abandoned. This is absolutely wrong, as breasts have been known to secrete milk as late as the twelfth day after confinement. Bottle feeding at this time should be accompanied by attempts at nursing.

Sometimes the secretion will be established, and later fail. Sometimes a spasmodic condition of the muscles of the mammary ducts will cause a "slow" breast. In both these conditions the symptoms of underfeeding will come on imperceptibly, and may not at first be attributed to the proper cause. This is especially true in the "slow" breast, which on examination will disclose a full, turgid gland. The infant, however, being unable to obtain the milk without fatigue, falls asleep and the mother supposes that he has had his fill. Nothing happens at first, for a healthy baby may receive no nourishment whatever for a whole day and show little change in the weight curve. After a time the infant ceases to gain, then a gradual loss occurs. If the total amount of food falls much below forty calories per pound of weight in the twenty-four hours, nutritional disturbances are always to be looked for.

After the weight begins to fall the child shows hunger symptoms. The skin becomes pale and wrinkled, the abdomen scaphoid and the temperature subnormal. The pulse is usually slow. The habit of sucking the fingers and rolling the head becomes almost constant. Constipation is the rule, and vomiting may occur. But a very characteristic feature of some cases is the small grass-green mucous stool, loose in consistency, but not frequent in number. This stool is not at all like the green stool of overfeeding, as it does not contain

any undigested milk. It is a really important sign of underfeeding.

Underfeeding during the first ten days of life is frequently accompanied by acute symptoms—the inanition fever described by Holt. This, as we now know, is really a fluid starvation, and is helped by giving food and water in abundance.

Differential Diagnosis Between Underfeeding and Illness

Usually the differential diagnosis between underfeeding and actual illness is not difficult. Loss of weight will be common to both conditions, but the giving of food to the infant in underfeeding will usually cause the weight curve to rise. In other conditions, especially dyspepsias, the contrary may occur.

The observation of Moll, that in alimentary disturbances the phosphorus of the urine is greatly increased above normal, while in starvation it is diminished, furnishes a simple laboratory method of determining whether a loss of weight is due to starvation or actual illness. If the phosphorus is not increased it may be assumed that the alimentary tract is not at fault.

But, the simple method of weighing the infant, clothes and all, before and after each nursing at various times for a couple of days and obtaining the average should never be omitted. Valuable information as to the amount of food taken from each breast will be obtained. A guide to the amount of additional feeding needed is also obtained in this way. Sometimes the amounts of milk taken at different times of the day remain remarkably constant from day to day, and the amount of additional feeding necessary at each

time may be determined with fair accuracy. Simple modifications of whole milk furnish the best temporary food at this time. The sugar in the mixture as well as the fat should at first be low in percentage and increased gradually. The additional food should always follow the breast feeding. Alternate feedings of breast and bottle should not be allowed. Sometimes the nursing of both breasts at one feeding and one breast and the bottle at the next will give good results. It is not an infrequent occurrence to have the bottle feedings abandoned after a little while as the breasts begin to functionate. In fact, it is a common observation to have the quantity and quality of the breast secretion improve rapidly when the mother is allowed to return from inforced invalidism to her usual mode of living. The practice of manual expression of the milk in the "difficult" breast after the infant has nursed has gained a wide vogue under the impetus given it by Sedgewick. The technique is described and illustrated on page 162 under "Extraction of Breast Milk."

It is a good plan, after the first month, even when the breast secretion is normal, to offer the infant part or all of one feeding from the bottle, in order to accustom it to that mode of feeding. Often when bottle feeding has become a necessity, especially in the later months, the infant exclusively breast-fed will refuse to take artificial food unless it has been previously habituated to it, and a period of great vexation and anxiety ensues for the mother, and sometimes also for the physician.

Painful Nipples

In enumerating some of the maternal reasons for difficulty in nursing, retracted and fissured nipples were mentioned. While the prophylactic treatment of the breasts

belongs to the obstetrician, I cannot refrain from urging the necessity for an examination of the breasts, especially of the primipara, during the later months of pregnancy. Retracted nipples should be anointed by the patient daily with cocoa butter, and gently drawn out with the fingers, or by means of a breast pump, using very little force. The use of alcohol or alum applications by the patient is, I think, a mistake, since it may make the skin on the nipple brittle and favor fissuring. The fissured nipple should always be protected by a glass nipple shield, as the pain of direct nursing may in itself retard the secretion and flow of milk. The electric breast pump or manual expression of the milk is useful in emptying breasts with very sore nipples.

Children Who Do Not Thrive

But, given all favorable conditions in the mother and in the quality and quantity of milk, there are some children who will not thrive. This is well seen in institutions where a wet nurse, under close supervision to prevent favoritism, will nurse two children of equal age, one of which will thrive while the other loses weight. What are these conditions in the infant that cause this food intolerance, and what do we know about them?

We are familiar with food anomalies in premature infants, in those suffering from congenital heart disease, in children with advanced syphilis, or born of mothers with kidney lesions or eclampsia. There are still some infants outside of these groups with a malnutritive tendency, which we have all seen and which some authorities attempt to classify.

Abt describes one type as "the neuropathic infant—the child born of neuropathic parents." These cases have been grouped by Heim in a class which he calls "the hypertonic

infant." Hochsinger also alluded to this group of cases in his text book in 1900. The symptoms are great nervous irritability, and a tendency to hypertonous similar to that observed in the first few days of life, often almost an opisthotonous. They wake easily, cry a great deal, and are apt to regurgitate food. Children of this class furnish most of the cases of pylorospasm. They seem always hungry, always colicky and, no matter whether fed by breast or bottle, fail to thrive during the first eight to twelve weeks. They act as if they had embryonic, or, at least, undeveloped nervous and digestive organs—and they probably have. They are very difficult to treat, and most unsatisfactory in every way. The giving of a grain or two of bicarbonate of soda about fifteen minutes before nursing, allowing the infant to eructate before putting it to the breast, and also holding it upright midway in the nursing for the same purpose, sometimes diminishes the regurgitation. Small quantities of protein milk preceding a breast feeding of five or six minutes sometimes help. The use of calcium-casein before feeding is advocated by Grulee, in combination with lactic acid bacilli. If these infants can be supervised for about four months they seem to thrive after that period. Overfeeding is dangerous, and their caloric needs should not be exceeded. The attacks of colic, especially those occurring at night, are usually of the intestinal type, and may be relieved by the rectal tube and a small quantity of salt solution by rectum. The methods advocated by Moser in the preceding chapter will be found to be especially applicable to the neuropathic infant.

The exudative diathesis of Czerny, the infants that have eczematous patches, a tendency toward enlargement of lymphatic glands and bronchial catarrh, and tolerate and digest food badly, is another vexatious group. Often it is thought by the mother that "the milk is too rich." Often such infants

are weaned, to the attending physician's sorrow. Seldom does weaning alone improve the condition, especially in the very young. Undoubtedly these children tolerate fat and sugar badly, and unquestionably, though a period of starvation will frequently improve the eczema, it will not improve the child. In such cases it is usually possible to obtain a gradual, but not average, gain in weight by cutting down the length of the nursing period, and preceding the nursing with an ounce or more of boiled skim milk and water, in quantity and dilution suitable to the age of the infant. The occurrence of intercurrent attacks of pharyngitis or bronchitis or adenitis in these infants will frequently lose in a day or two what has been gained in a couple of weeks. The marantic appearance of the child suggests that the malnutritive condition is more important than the eczematous diathesis. Here, again, small quantities of protein milk may be used to advantage instead of skim milk. For protein-milk seems, in some way which we do not understand, to increase the tolerance for both fat and sugar.

The importance of this subject of breast feeding is such that any attempt, however inadequate, to keep its discussion alive, has some justification.

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CHAPTER V

DISEASES COMMONLY SEEN IN THE NEW-BORN

By JOHN A. FOOTE

The first few days of the infant's life in the world are marked by a tendency to a deep sleep which in some respects simulates anæsthesia. A temperature of about 100° F. by rectum is not unusual in the first twenty-four hours after birth. Sometimes after the second day of life rather high temperatures occur, amounting to 103° or 104° F. and ascending to this height usually on the fourth day. With such pyrexias the infant's skin and mucous membranes are parched and dry; he is restless at first and cries, but becomes more somnolent as the temperature rises. He has perhaps been placed at the mother's breast, but does not nurse well. This condition occurs more frequently with the first lactation than with succeeding ones. It is commonly found when the infant has this fever, that the mother's breasts are engorged and the extraction of milk is not an easy matter.

Inanition Fever

This febrile condition was named by Holt inanition fever, and has variously been attributed to lack of fluid, transitory sepsis, intestinal auto-intoxication, and many other causes. Lack of fluid undoubtedly plays a part in its etiology, though probably not the sole part. Theobald Smith's recent researches in animal husbandry, proving the bacteriolytic action of colostrum, would tend to show that when the child has not nursed

a sufficient amount, colonization of bacteria in the lower bowel may occur to an excessive degree. That is probably one reason why the fever abates as soon as a good milk flow has been established and sufficient fluid has been given. The colostrum may possibly destroy the bacteria which were growing so rapidly in the previous inert meconium, or it may at least neutralize their toxins.

The foregoing is the most common type of fever which occurs in the new-born child. Alarmingly high temperatures are not uncommon in this condition.

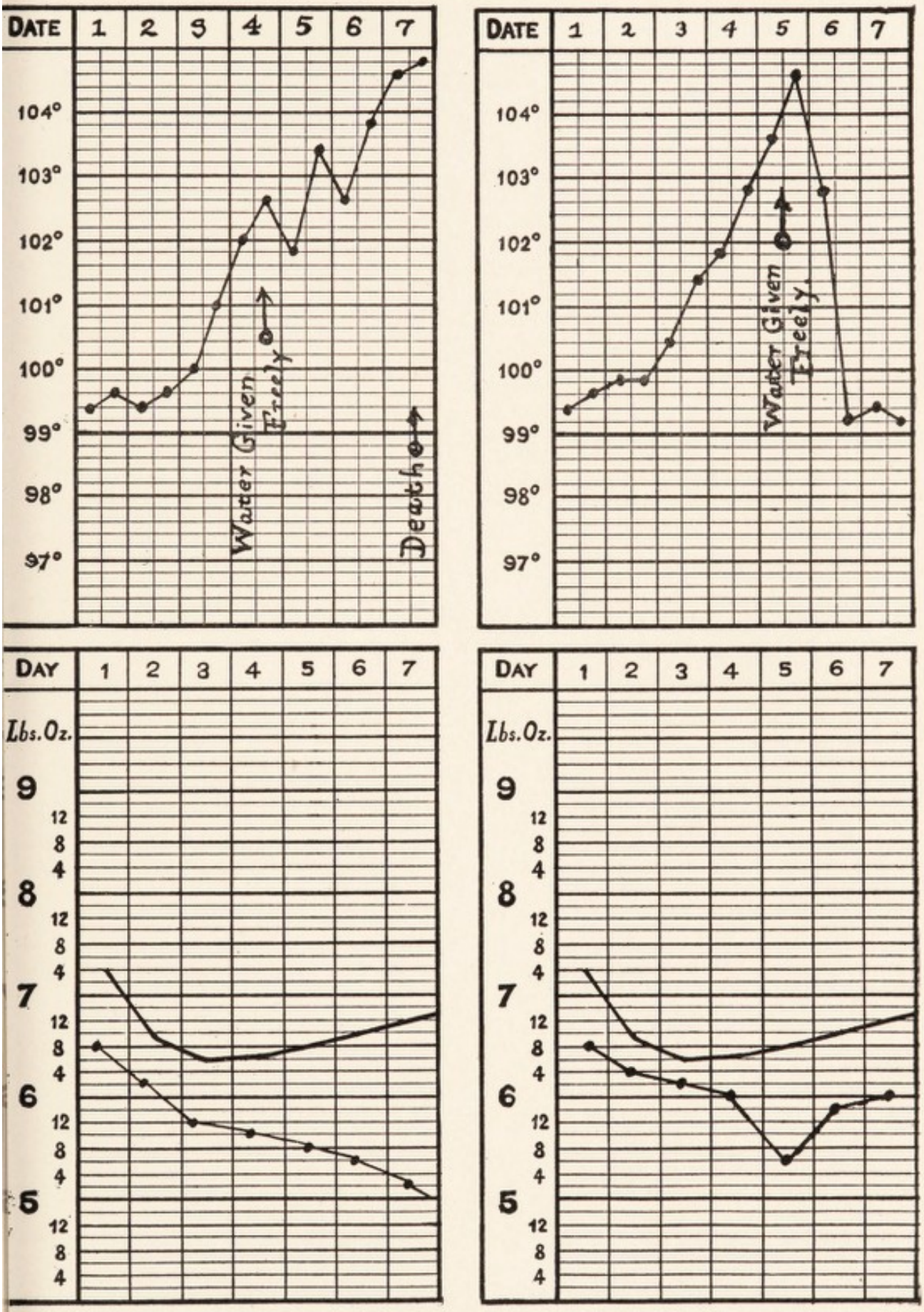
The prognosis is good provided proper treatment is instituted without delay. Unfortunately, a not infrequent and usually fatal disease, pneumonia of the new-born, resembles inanition fever in its symptoms to such an extent that it is almost impossible to differentiate these two maladies at first. Pneumonia of the new-born frequently proves fatal to the infant before any discernible physical signs are manifest. Cyanosis is usually found in the later stages of pneumonia, and is not present in inanition fever unless the latter is accompanied by cerebral hemorrhage or a badly compensated heart lesion. Any febrile condition in the infants occurring in the first few days of life which persists after sufficient fluid has been administered should be given at least a guarded prognosis. (Chart I.)

Treatment should be directed toward:

(1) Facilitating emptying of the mother's breasts by aspiration or expression of the milk *without breast massage* (since the turgidity of the breast is frequently due to congestion of the gland with blood and not to distention with milk).

(2) Giving the infant small quantities of half-strength salt solution by rectum every three hours.

CHART I.



Pneumonia of New-born

Inanition Fever

Temperature and weight charts contrasted in pneumonia of the new-born and inanition fever. The critical drop of temperature in inanition fever is shown after fluid has been freely given.

(3) Giving measured quantities (2 oz.) of boiled water by mouth every three hours, together with expressed colostrum.

(4) Putting the infant to the mother's breast at three-hour intervals.

Within twelve hours of this treatment the temperature usually drops by crisis.

The Blood and Anemia in the New-born

The blood in the new-born shows a very high hemoglobin, and also a high red-cell count. The hemoglobin usually reaches 110 to 120 at birth, and tends to fall rapidly until it reaches 90 at the end of the second month.

At the age of three days the hemoglobin has usually dropped to 95 or 100, but the red cells remain at 5,000,000 to 7,000,000. Premature babies and some new-born babies may have nucleated red cells for the first few days, and their presence should not at this time be regarded as pathological.

A leucocyte count is present at birth of 16,000 to 20,000 per cubic mm. The differential count just after birth shows at first a neutrophilic preponderance 60 to 70 per cent. The leucocytes change so that at the end of the first week this condition is reversed, and the mononuclears number 75 to 80 per cent, in which the small variety predominate. The typical differential count at the end of the first week is usually neutrophiles 15, small mononuclears 77, large mononuclears 4, transitional 3, œsinophiles 1. Leucocytic counts below 15,000 in the first month have seldom any pathological significance.

Anemia of the new-born is not extremely uncommon. It is seen within the first week, and may be dependent upon hemorrhage from an incompletely separated placenta during labor, hemorrhage from the umbilical cord, or somatic hemor-

rhage after birth. A hemoglobin of 90 or less in the new-born during the first week of life is suggestive of blood loss.

An anemia from no describable cause, but characteristic of blood loss, is seen in some infants during the first week of life. A new-born child seen in my own practice who had been delivered by forceps, after slow labor, showed on the seventh day Hg. 20, r.b.c. 950,000, and a few myelocytes in the differential. The cell count rose rapidly after two transfusions with citrated blood, and the child is now a normal infant.*

The technique of transfusion is given under "Methods" on page 182, and the general treatment of the hemorrhagic tendency is outlined below.

The Hemorrhagic Tendency

Another condition which usually manifests itself within the first week of life, is the hemorrhagic tendency, with or without intracranial hemorrhage. In rapid labor, especially when a premature or very small infant is violently pushed through the birth canal by strong pains, or in very arduous and protracted labor, in such operations as version or even in breech delivery, mechanical injuries to the small veins issuing from the superior longitudinal sinus, or from the vessels of the tentorium cerebelli, may cause either small or large extravasations of blood. In marked asphyxia, even without much trauma, small vessels may be ruptured. But when the *larger* vessels are torn, very rapid and fulminating symptoms such as blueness, rigidity and convulsions arise, followed by death in a short time. When small vessels are ruptured these symptoms come on quite insidiously, and are frequently not recognized as characteristic of intracranial hemorrhage. Indeed atelectasis, congenital heart disease and other conditions are

* Since the above was written, the writer has seen another infant three weeks old with the same condition.

frequently thought of, rather than the real condition. The general subject of intracranial hemorrhage is so important that it will be discussed in a separate chapter.

Are All New-Borns Potential Bleeders?

Another factor also comes into play which may, after three or four days, convert an otherwise negligible leakage of capillary-like vessels into a prolonged oozing with ultimate causation of intermittent asphyxical blueness and spasmodic symptoms. This factor is the so-called hemorrhagic tendency which all infants possess to a greater or lesser degree during the first days of life. Autopsies have shown that many infants had intracranial hemorrhage at birth with no symptoms of any kind during life to call attention to it; and Lucas and his co-workers have established the fact of a certain degree of delayed coagulability of the blood in almost all infants during the first week of life. When this tendency of delayed coagulation is extreme, symptoms of hemorrhage arise which may be manifested by a symptomatic complex involving the central nervous system, or by signs of oozing from any or all of the membranes which line the orifices of the body. Thus bleeding from the rectum, from the mouth, or from the nose or ears, or bloody vomitus, and especially oozing from the stump of the umbilicus may suddenly appear. But if any trauma has occurred to the small cerebral vessels, brain symptoms precede the local signs and may dominate the clinical picture, and may or may not be followed by hemorrages from the mucous surfaces.

The Symptoms of Intracranial Oozing

This general oozing from mucous surfaces is known as spontaneous hemorrhage of the new-born, or when it is seen mostly in the alimentary tract is called melena.

Melena vera, bleeding from the intestine, is not an uncommon condition which may be due to injuries or ulcerations of stomach or duodenal mucous surfaces, possibly due to birth trauma, or occurring as part of a general hemorrhagic tendency. It is accompanied by a secondary anemia as a result of the loss of blood. The treatment is that used for spontaneous hemorrhage.

Intraperitoneal or intravenous transfusion, if used early enough, produces strikingly good therapeutic results.

It has in the past been a very fatal condition, but treatment by hemostatic therapy, if instituted *early,* offers hope of reducing its former high mortality. Therefore any infant showing even a trace of blood in the stool within three days after birth should have vigorous treatment. Sometimes a considerable amount of bleeding occurs before it becomes apparent. The writer has found large submucous hemorrhagic areas at autopsy, especially in the neighborhood of the cardia, the pylorus and the rectum—in a word where muscles have a sphincter-like action. These areas contained fairly large amounts of old transuded blood.

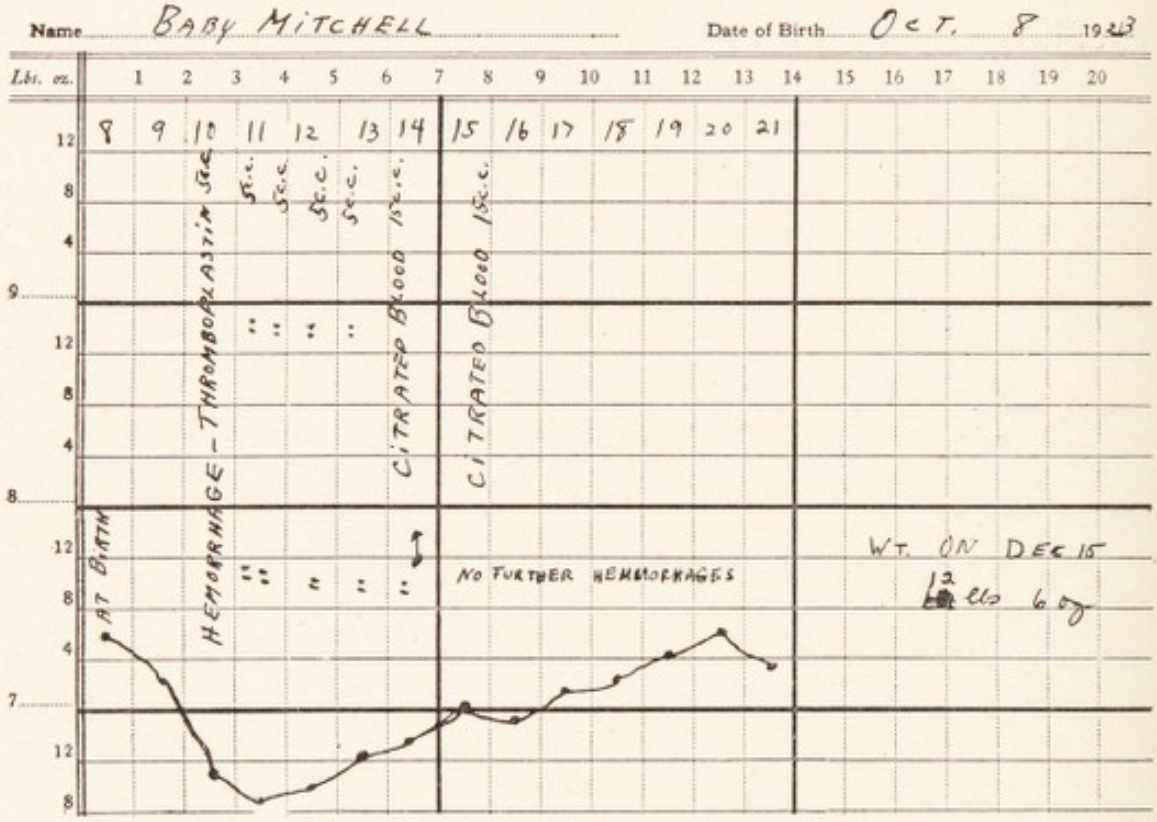
The Treatment of Hemorrhagic Disease

The treatment of hemorrhagic disease consists in (1) absolute quiet for the infant, abstinence from the effort of nursing or the ritual of bathing and dressing; (2) feeding with expressed or aspirated breast milk with a Breck feeder; (3) the injection under the skin or into the fontanelle of coagulative substances. The injection of 10 cc. of citrated blood from the parent into the superior longitudinal sinus by way of the fontanelle is very satisfactory. The use of 10 to 20 cc. of liquid thromboplastin or 1 cc. Fibrogen (Merrill) subcutaneously is also advisable when human blood is not

available. Whole blood may be injected subcutaneously; but the writer has successfully used citrated blood by intraperitoneal injection after the method of Siperstein. Although small amounts such as 10 cc. were used at first, better results were

CHART II.

INFANT'S DAILY WEIGHT CHART



The intraperitoneal injection of human blood in spontaneous hemorrhage. This infant showed varying amounts of fresh and clotted blood in the stools beginning thirty-six hours after birth and continuing for four days in spite of small, and probably inadequate, doses of thromboplastin. No hemorrhages occurred after intraperitoneal injection of citrated blood. This is one of a series of six cases, with one fatality, due to late treatment.

obtained by injecting 60 cc. at one time. The technique is described on page 178. Only one fatality occurred in this series, and this was shown by autopsy to have been due to late treatment, and possibly an insufficient amount of blood relative to the large primary blood loss. (Chart II.)

The treatment of spontaneous hemorrhage from all parts of the body is essentially the same. The injections, or trans-

fusions, should be repeated every eight hours till the bleeding is controlled.

While Siperstein at first did not stipulate the need for blood matching in intraperitoneal transfusion, his most recent work advises hæm-iso-agglutination tests whenever possible.

Possible Errors in Coagulation Tests

The use of coagulation tests in the diagnosis of this condition has not proved as effective in the hands of clinicians as among the laboratory workers. The variations of error are too numerous, probably because of differing personal equations among workers in following the technique. Any method involving a stab wound in the new-born may produce an excess of thrombin, through the cell injury involved. For this reason the ordinarily employed capillary-tube methods of estimating blood coagulation time in the new-born give a false picture of rapid clotting. This was well demonstrated by Rodda, and it may be said that the ordinarily used capillary-tube method is of no value. The aspiration of blood through the fontanelle with a fine syringe and using 2 cc. in a cylindrical tube is believed to be an accurate method, but it is not suitable for general use. A simple estimation of the time required for blood to coagulate when a skin wound is made is probably as reliable a test as any method for clinical use. This method advocated by Duke consists in making a stab-wound in the heel and then, without squeezing, wiping away the exuded blood gently with blotting paper until bleeding has ceased. Normal, new-born infants have a bleeding time of not over three to four minutes.

A simple method which might supplement the clotting time consists in using two watch-crystals cleaned with alcohol, catching a drop or two of blood, *after wiping away the*

first drop, and placing a hair in the clot. Count from the time the first drop appears. Nine minutes is the usual maximum normal time when this method is employed. The hair imbedded in the blood will tell when the clot can be raised, to show that clotting is completed. It is my custom in emergencies to estimate the hemoglobin by wiping away the first drop of blood with a piece of white paper and using the

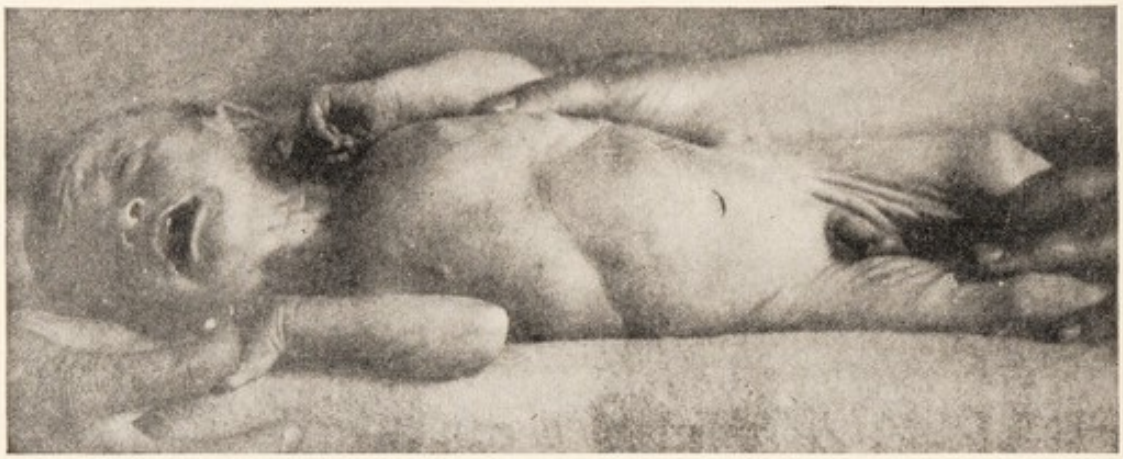


Fig. 12.—Congenital pyloric stenosis; the visible peristaltic wave. Children's Hospital, Washington, D. C.

Tallqvist scale. The new-born baby has a hemoglobin of 100 to 120 normally. With a hemoglobin of 90 Tallqvist it is well to suspect an internal hemorrhage of considerable degree. Eighty is very low. The showing of external blood may be delayed in intracranial hemorrhage or submucous hemorrhage, and the rough estimation of the hemoglobin gives a hint as to the actual blood loss.

Jaundice of the New-born and Late Hemorrhages

Jaundice of the new-born is almost a physiological condition. It usually clears up within the first couple weeks of life. Jaundice persisting after the first month may be due to a congenital narrowing or occlusion of the bile-ducts. Persistent jaundice accompanied by high fever characterizes

certain forms of sepsis accompanying umbilical infection. The use of calomel in the new-born to cure jaundice is worse than a therapeutic anachronism—it is very near to malpractice. Usually at this time the stump of the umbilicus will show an inflammatory reaction, though deep thrombi may cause sepsis with little external evidence, and indeed sometimes with little accompanying fever.

Since infection increases the amount of antithrombin in the blood, late hemorrhages either of the brain or the mucous surfaces may occur as a result of sepsis. The treatment is purely symptomatic.

Pylorospasm and Pyloric Stenosis

Pylorospasm or pyloric stenosis is a disease of the latter part of the first month of life. George Armstrong's classical case, the first in the literature, to which attention was called in 1918, occurred in an infant aged three weeks. Nearly always the symptoms appear within the first month. Robust breast-fed infants are frequently affected. Persistent forcible and projectile vomiting, a visible peristaltic tumor travelling toward the duodenum and scanty stools, often of a starvation type, characterize this condition. It usually comes on suddenly. Some cases can be controlled by stomach-washing, feeding with thick cereal gruels and the use of atropine internally. Sauer used a paste made up of 270 cc. skimmed milk, 360 cc. water, 60 gr. farina and 30 gr. dextri-maltose boiled an hour or longer in a double boiler until while still hot it is thick enough to adhere to an inverted spoon. At least two tablespoonfuls were fed six or seven times a day. Nursing infants were given some of the paste before a limited breast feeding, or the paste was made with expressed breast milk. Finkelstein believes the composition of these feedings

to be less important than the consistency. They must be viscid. Porter ingeniously uses a "Hygeia" nipple, slit at the end, as a sort of funnel through which the infant can suck the paste which is dipped into the nipple. This paste must be kept warm while being fed to the infant. Atropine sulphate is given in doses of 1-1000 grain about one-half an hour before meals. This quantity may be gradually increased, but caution should be exercised. Most cases, however, are best treated by the operation of pyloroplasty. It is important not to postpone operation until the mother's breast secretion has dried up, or until the infant has lost much more than 10 per cent of his weight. Watchful after-care including the use of breast-milk in rapidly increasing doses is essential to the attainment of successful results. Many infants not operated on, who persist in rejecting food, develop inanition and die after two or three months of some intercurrent condition. A gain in nutrition is, therefore, one of the best criteria of a cure, aside from the cessation of projectile vomiting.

Secretion of Breast Milk and Mastitis in the Infant

Often, within the first two weeks of life, the infant's breasts become tense with incipient milk secretion, and remain engorged for a variable length of time. Nurses or attendants should not be permitted to milk or massage these breasts, as such action will promote further milk-secretion. Bandaging over gauze with light pressure, and lubrication with a bland oil are usually sufficient to cause resorption and abate the condition. Camphorated oil is a time-honored domestic remedy.

True mastitis may develop in the new-born infant, though its occurrence is not common. Expectant treatment should

be used at first, but if rigors and high fever result incision and drainage of the abscess is indicated.

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CHAPTER VI

SKIN AFFECTIONS OF THE NEW-BORN

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When one starts out to consider this question, one is confronted with the problem of separating the affections seen in the first few weeks of life from those that occur later. This is a rather difficult procedure, as the exact age of onset of many of the babies' affections are not set forth in the text-books. I shall therefore have to depend largely on personal observations as to the diseases coming within the limits of the subject.

Congenital Malformation of the Skin

Of the strictly congenital malformations of the skin one must consider (1) ichthyosis, (2) epidermolysis bullosa, and (3) congenital hypertrichosis. The first of these is seen in the early weeks of life only when very severe, and in the cases the skin is thick, dry, cracking at the joints, and shedding scales constantly. This is the so-called harlequin fœtus, and the baby rarely survives. In the type considered by Bowen as " example of the persistence of the epitrichial layers which has usually been cast off by the seventh fetal month, but in these instances maintained its integrity to the time of birth, when it enveloped the infant like a membrane. After a short time this membrane peels off in large masses and sheets, leaving the normal skin below in a state of moderate desquamation." The condition is not serious, however. At times this condition may occur in linear arrangement over a limited area, causing linear nævus of the keratotic type. Treatment for

the generalized condition is simply to keep the skin greased and clean. (Fig. 13.)

(2) Epidermolysis bullosa is due, probably, to congenital absence of elastic tissue in the true skin, so that on injury the

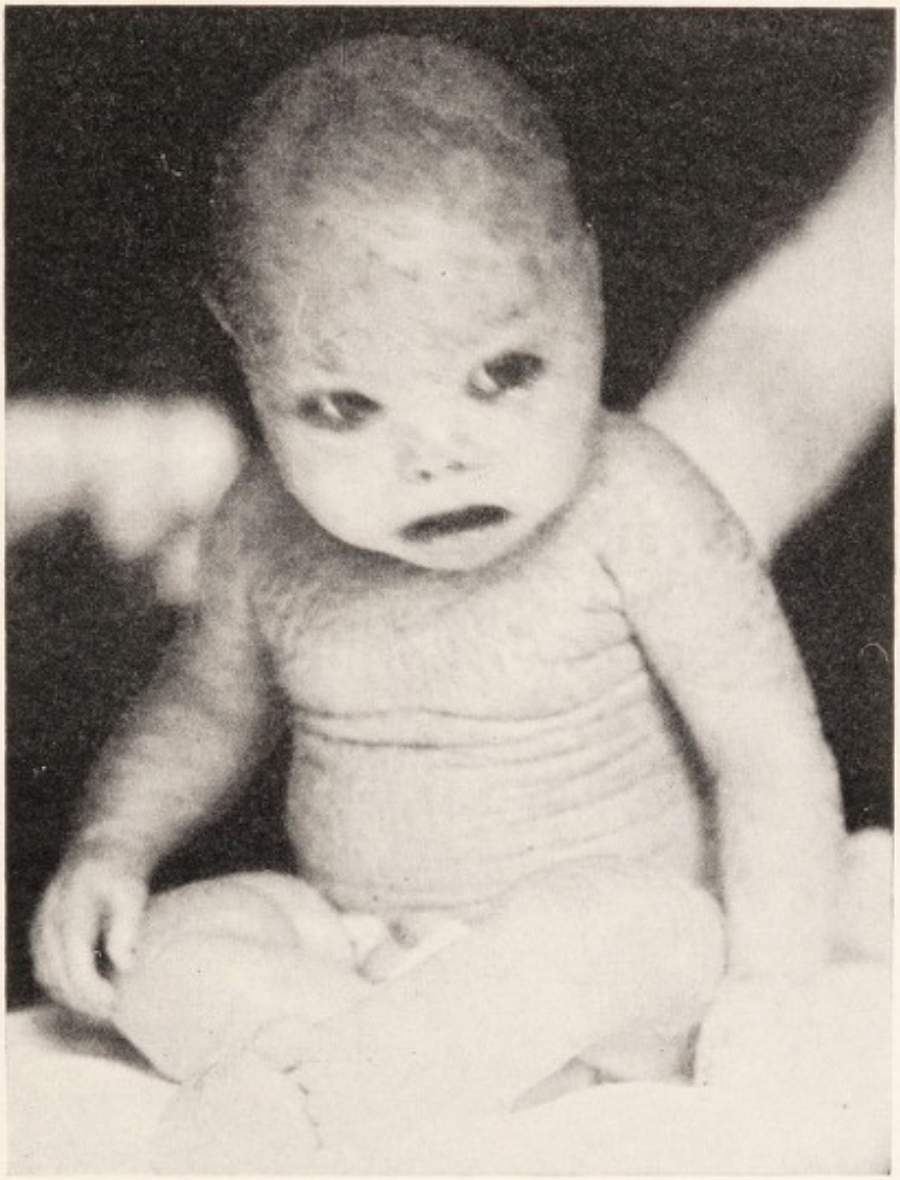

Fig. 13.—Ichthyosis ("harlequin fœtus").

skin responds with the formation of bullæ, which heal with flat, superficial scars. In most cases it is manifested later in childhood. There is no treatment except care in avoiding friction and injury to the skin.

(3) Congenital hypertrichosis are the hairy men and women of our circus side-shows. The downy hair often present at birth persists and becomes long and coarse, instead of shedding. There is no treatment.

Two Common Diseases

Two very common diseases seen in infancy are miliaria, or prickly heat, and intertrigo. Miliaria may be macular, papular, or vesicular, but a combination of closely set bright red discrete papules, with occasional vesiculation, and considerable inflammatory aveola is commonest. In the vast majority of cases it is a preventable disease, due to excessive perspiration from overclothing. In very hot summer it may be unavoidable, however. The infants should be so dressed that they do not perspire, and a light dusting powder freely applied. Soap should not be used in bathing, which should be performed with warm normal salt solution. Intertrigo is an acute catarrhal inflammation of the skin, usually in the diaper region of infants, and caused by lack of care in keeping the baby dry and clean. It may occur in the folds of the neck, under the arms, etc., as a result of irritation from perspiration. The treatment is along the same lines as that of miliaria.

Streptococcic Infections

The diseases due to the infection of the skin are much the most serious and important group to be considered, because they often result fatally to the patient. They require extreme care in diagnosing and isolating, especially in institutions, as severe epidemics with high mortality may be caused.

The two skin diseases caused by streptococci both occur in the new-born. *Erysipelas* is an infection, fortunately rare, occurring at the umbilicus. It is presumably due to infection

of the cord, and for the most part is preventable by aseptic technique. The disease sets in with a sharp rise of temperature and an intensely red, dusky, œdematous, sharply marginated inflammation of the skin about the umbilicus. Vesicles and bullæ are more apt to occur in this than in the adult type. It is nearly always fatal, and has the same clinical course as the adult type. General supportive treatment is all that can be done. Of course, these cases should be instantly isolated.

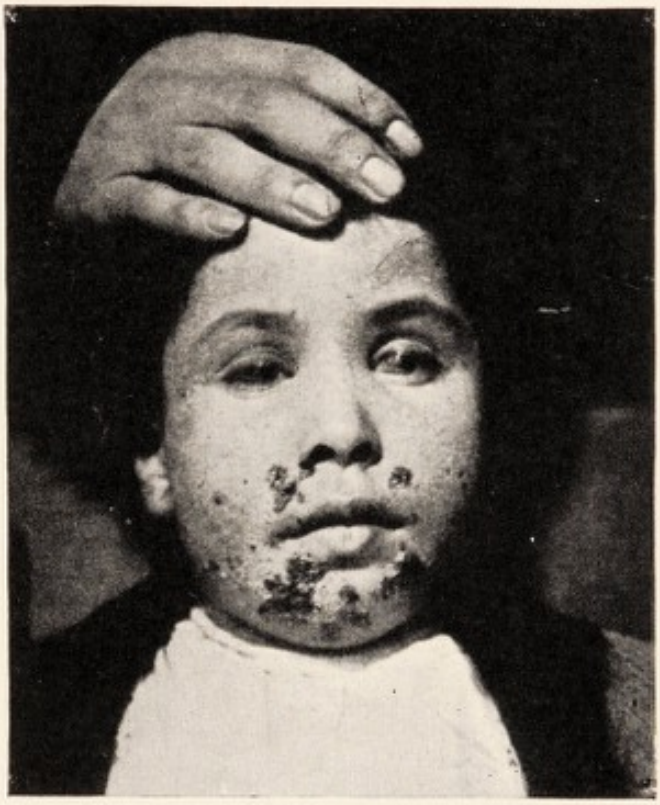

Fig. 14.—Impetigo contagiosa.

Impetigo contagiosa, the other disease due to streptococcus infection primarily, is in older children and adults a matter of little concern. (Figs. 14 and 15.) Ordinarily this disease is produced by a strain of streptococcus of very low virulence, and while one sometimes sees impetigo after erysipelas and other severe streptococcus inflammation, it is an exceedingly rare occurrence for the opposite to occur. In infants, however, and particularly in maternity hospitals and infant wards, this ordinarily benign disease becomes a matter of grave importance. In impetigo the primary vesicle is due to streptococcus, the crusted ulcer and subsequent course to secondary staphylococci. Two things may happen, therefore, (1) the infant himself may become the victim of the severe condition, *pemphigus*

neonatorum. (2) Infection of other infants from the original focus may take the form of this dread disease. Early recognition and promp treatment are therefore of vital importance. In the ordinary form the disease begins as an exceedingly superficial and thin-walled vesicle, which ruptures within a few hours and leaves an ulcer extending only to the rete, which is rapidly covered by the typical yellow, stuck-on

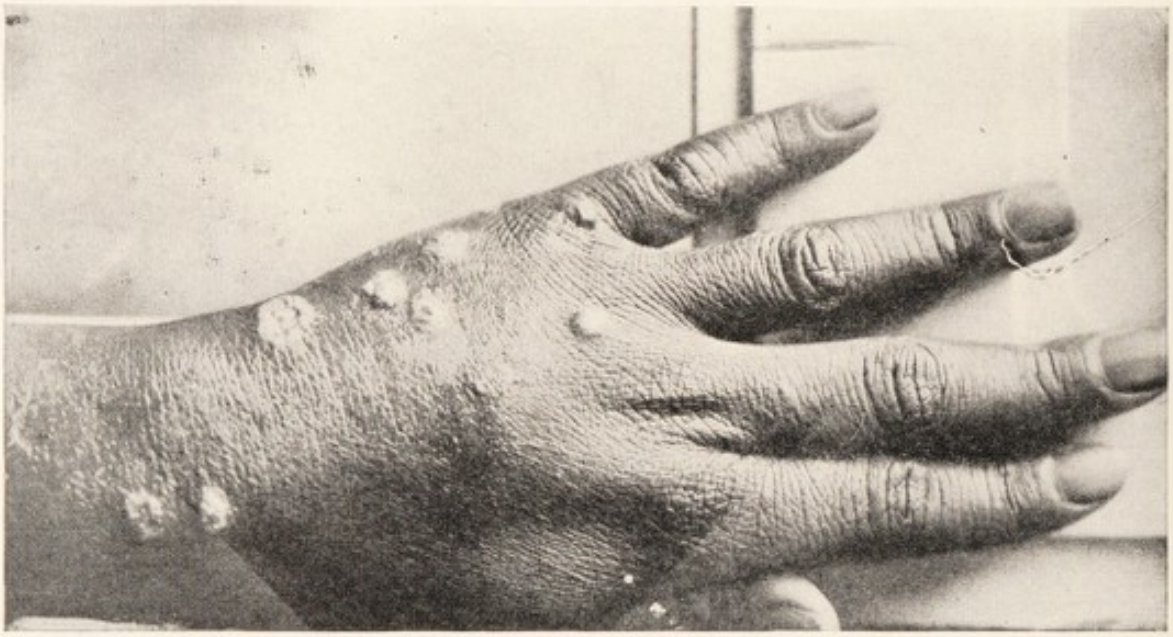

Fig. 15.—Bullous impetigo.

crust. One seldom sees the vesicle stage, the crust being the typical lesion. In bullous impetigo, however, a form not uncommon in children, the lesions are small or large bullæ filled with pus and serum, and not rupturing for a day or two. For the sake of prognosis, this must be distinguished from the *pemphigus neonatorum* by the absence of exfoliation and of severe constitutional reaction.

The best treatment in this case is to remove each crust and open each vesicle, then paint all lesions and the immediate area about them with a 3 per cent to 5 per cent silver nitrate solution. This is followed by a dry dusting powder if the

disease is extensive, and repetition of the procedure in new or active lesions once a day. A 1 per cent or 2 per cent yellow oxide of mercury ointment, or a 5 per cent ammoniated mercury ointment may also be used after removing the crusts, but is not as efficient alone as with the silver nitrate treatment.

Pemphigus neonatorum is a bullous disease of the newborn caused by streptococcus or staphylococcus. It is a much

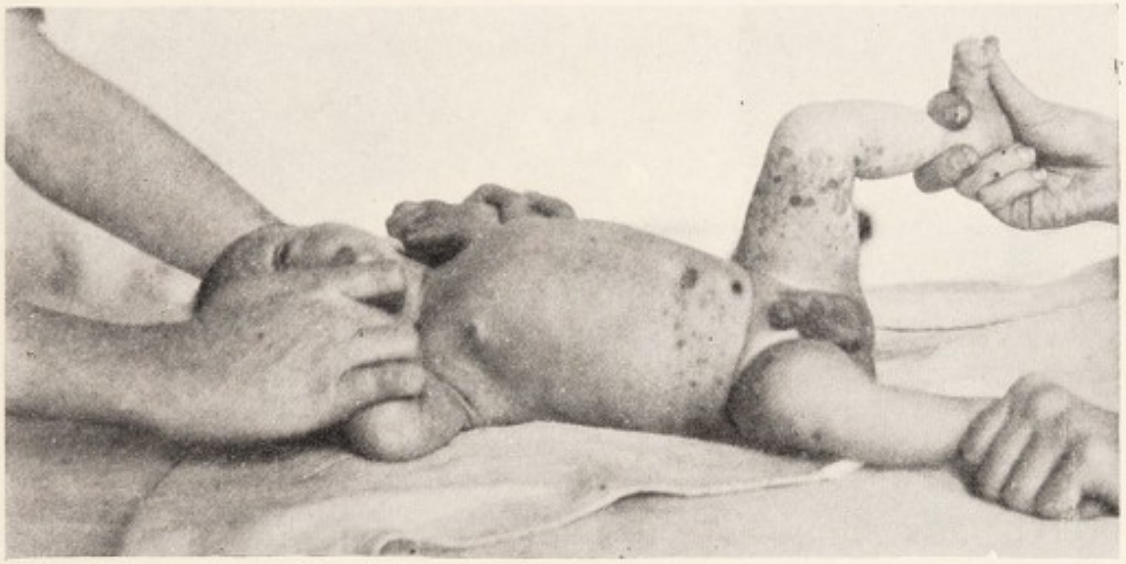

FIG. 16.—Bullous impetigo. Stage of crusting. Children's Hospital, Washington, D. C.

more serious disease than *impetigo,* frequently resulting in death. The mortality in different epidemics varies from 10 to 50 per cent. There occur bullæ, macerated exfoliation, subnormal temperature, and death from marasmus, or a very slow recovery in favorable cases. General supportive measures, careful feeding and dusting powder are the mainstays of treatment.

Application of the aseptic technique of the delivery room to the nursery will prevent the spread of these infections. They are most frequently spread by the hands of attendants or by direct or indirect contact with infected articles.

Infantile Eczema and "Milk Rash"

Three conditions are commonly grouped under this heading, although each is really a distinct disease. First we may consider *infectious eczematoid dermatitis,* the so-called "milk rash." This, in infants, starts as an infection of imperfectly cleaned vernix caseosa in the scalp, and spreads over the face and body as an eczematous or impetigenous eruption. It has little relation to diet, and is apt to start earlier in infancy than true eczema. It presents a crusted, oozing scalp and vesicles, erythema and crusts on the face, with occasionally erythematous patches on the extremities. This disease is due to the staphylococcus, and will clear up promptly, as a rule, with the use of antiseptic and stimulating ointments, of which one of the best is a 5 per cent crude coal-tar in Lassar's paste.

True *eczema* does not as a rule begin until the second month or later, although occasionally it does begin earlier. The picture of red inflamed cheeks and vesicles here and there, with oozing and crusting in bad cases is familiar to everyone. Our present-day conception is that infantile eczema is a dietary disease, primarily due to a sensitization to foreign protein. The commonest are egg and cow milk, but various vegetables and meats may be the exciting cause. In breast-fed infants the protein passes through the mother. In any case the disease is greatly aggravated by faulty feedings, not enough water, and fat, carbohydrate, or starch indigestion. Treatment consists in correcting the diet, eliminating absolutely the protein at fault, when this is possible, and using locally the coal-tar ointment referred to or a 1 per cent yellow oxide ointment.

Great comfort can be given these patients by the use of very small doses of unfiltered X-ray.

The third disease which is usually called infantile eczema is *seborrhœic dermatatis.* This is not infrequent in the new-born, and occurs as yellowish red papules confluent for the

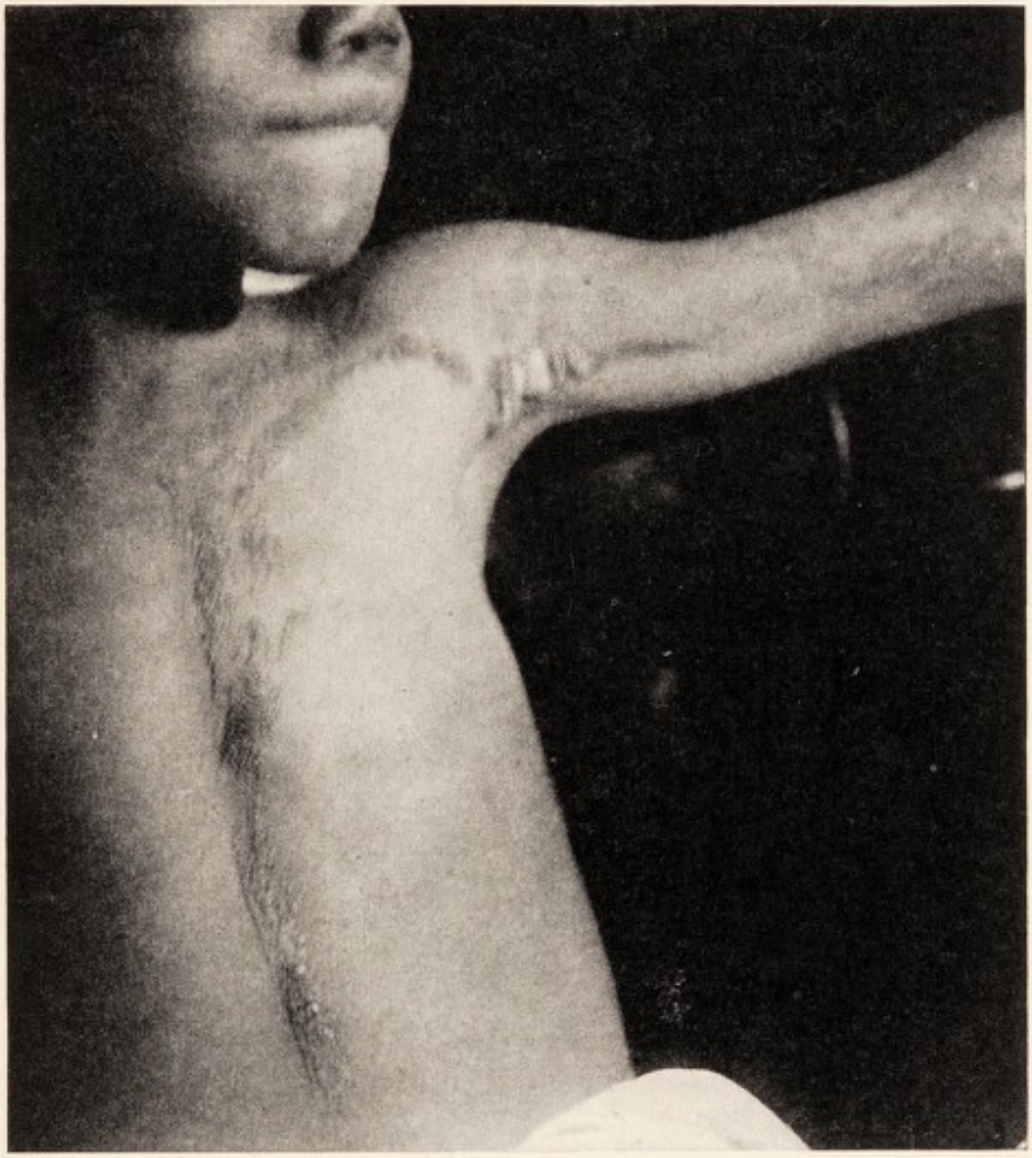

Fig. 17.—Linear nævus verrucosus.

most part, and covered with more or less crust of greasy scales. The acute form is usually diagnosed as infantile eczema. The more sluggish forms markedly resemble the papular confluent syphilides sometimes seen in new-born children, and only the absence of other characteristics of

syphilis will settle the diagnosis at times. The treatment consists in the use of a mild sulphur ointment, such as precipitated sulphur, gr. x; acid salicyl., gr. v; white petrolatum, oz. 1. All forms are readily amenable to treatment, but are prone to recur. A mild infection of the bottle bacillus with the staphylococcus is the immediate cause. Nævi are of many

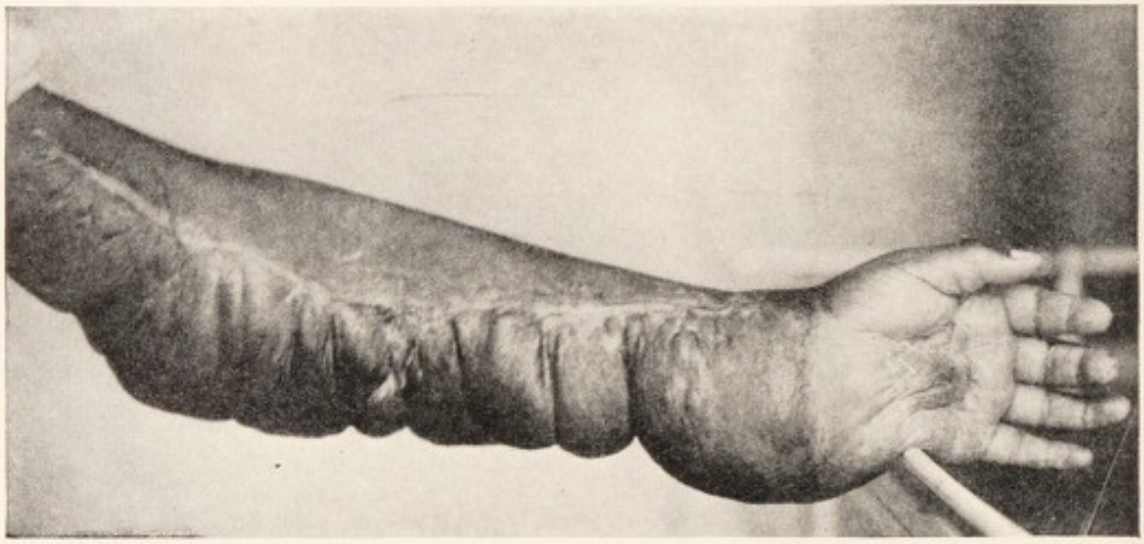

Fig. 18.—Linear nævus which was present at birth.

varieties, and are to be treated surgically, or by carbon dioxide snow, X-rays, radium, thermocautery, etc. (Figs. 17 and 18.)

Syphilitic Eruptions in the New-Born

In general the lesions of congenital syphilis seen in the early weeks of life do not differ from those in the adult. Cases of chancre acquired during passage through the birth canal, and usually occurring on the head, have been reported. Aside from these rare cases, the children are born with congenital syphilis in the stage corresponding to the secondary stage in the adult, *i.e.*, with a general dissemination of spirochetes throughout the body. Not all congenital syphilitics show skin symptoms early in life, or at any other time, by any

means, so that the absence of a rash does not exclude the diagnosis. When a rash does occur, there are certain forms seen more commonly. First of all, scaling of the palms and soles with a diffuse redness, or general mild exfoliation is strongly suggestive, but not diagnostic. Vesicles and bullæ do occur in early congenital syphilis, but certainly are not common, as

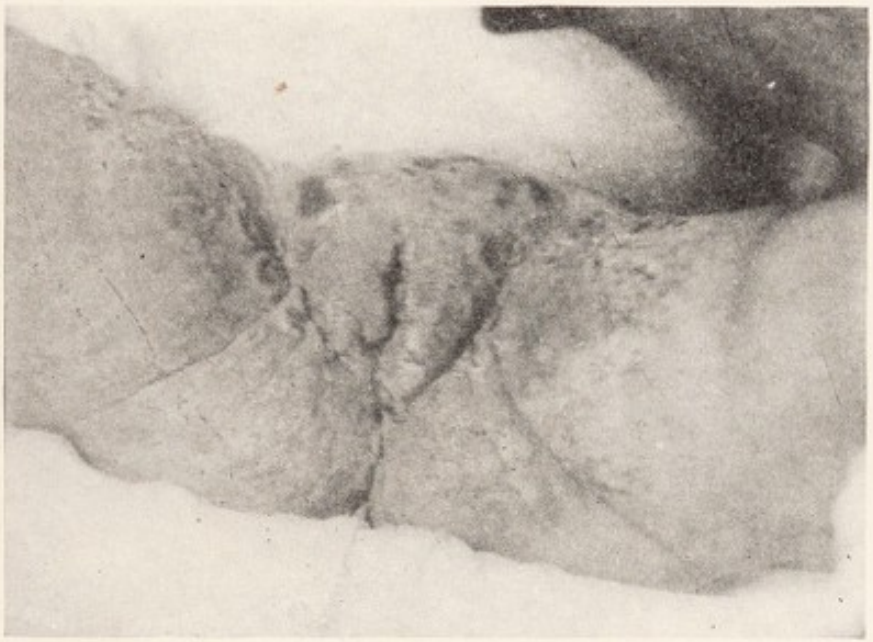

FIG. 19.—Condylomata in congenital syphilis.

one might be led to believe. These lesions are not characteristic unless superimposed on papules, or occurring with them. The lesions must be distinguished from bullous impetigo and pemphigus neonatorum. From the former the diagnosis may be made by the absence of any other signs of syphilis; from the latter by the local beginning, gradual progress, marked exfoliation, and severe course, as well as other signs of syphilis being absent.

The eruptions one usually sees are: macules, usually relatively large, dark red, and scattered over the body; maculopapules, a pink, generalized, non-scaly, and generally discrete eruptions as to individual lesions; true papules, sometimes

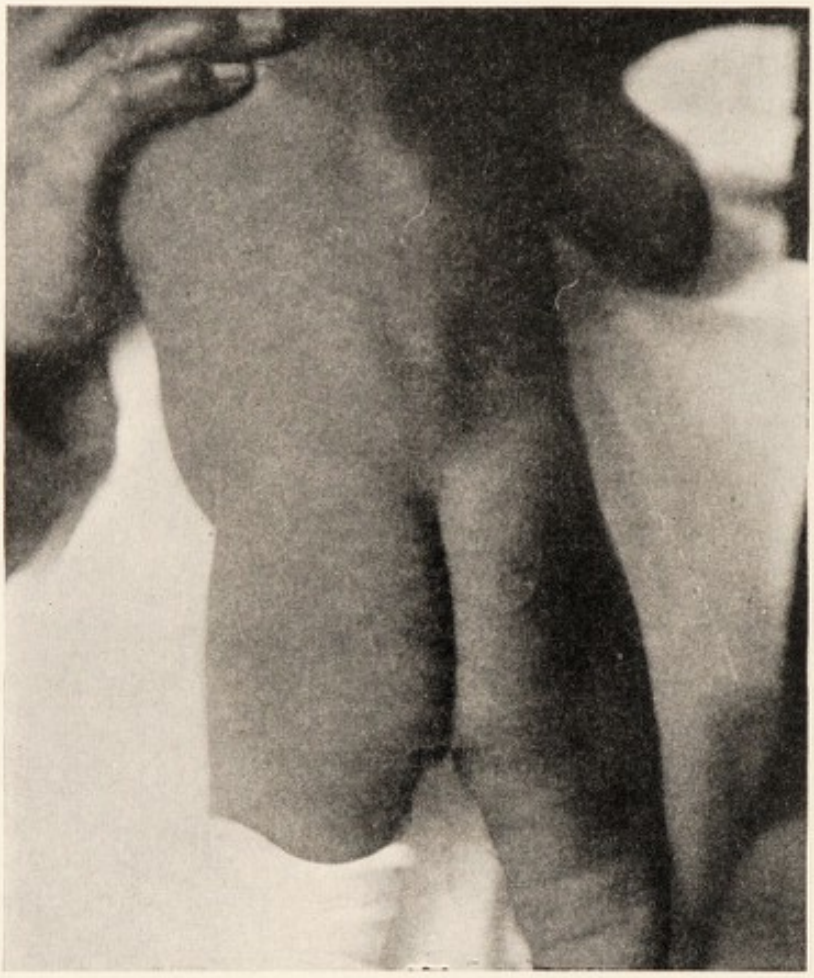

FIG. 20.—Congenital annular syphilis.

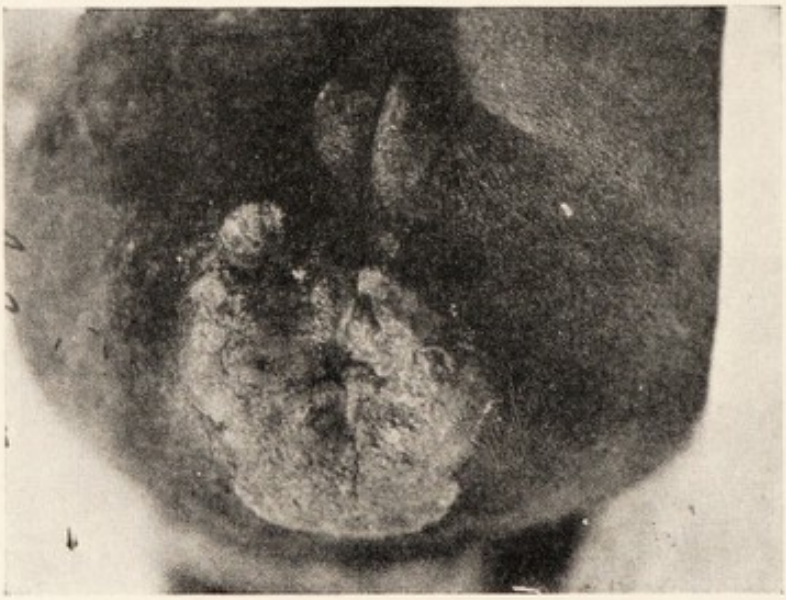

FIG. 21.—Large condylomata.

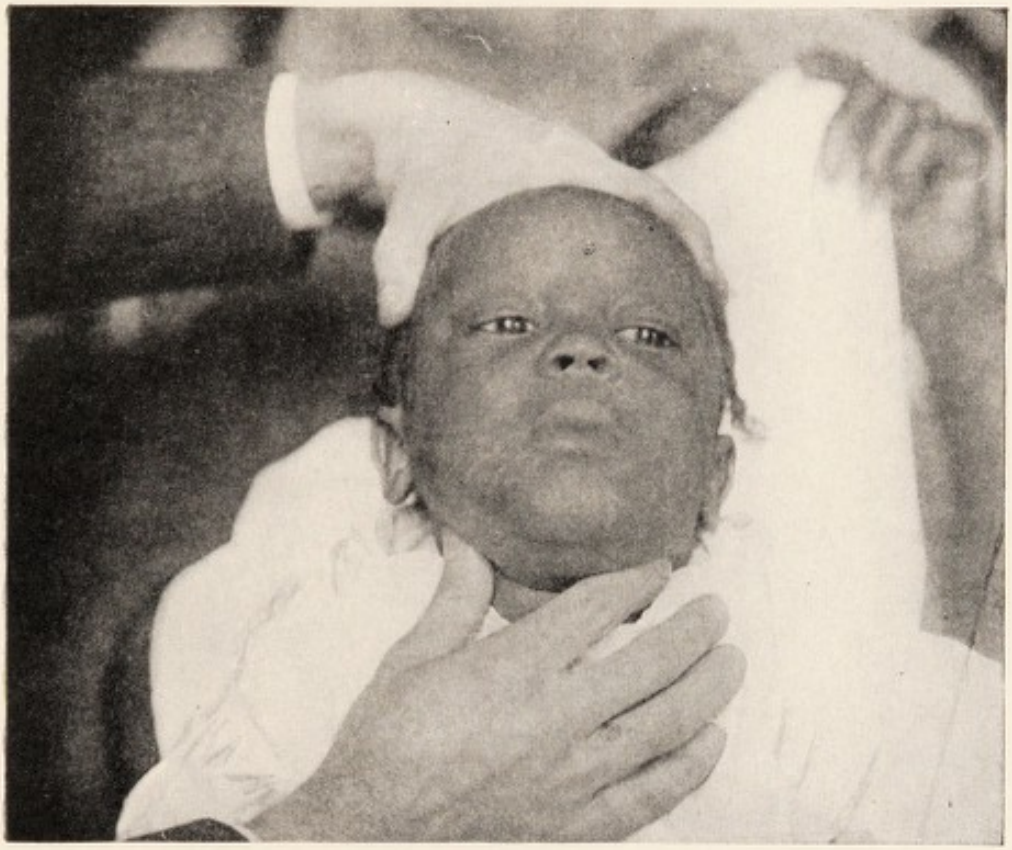

FIG. 22.—Congenital syphilis stigmata around the mouth.

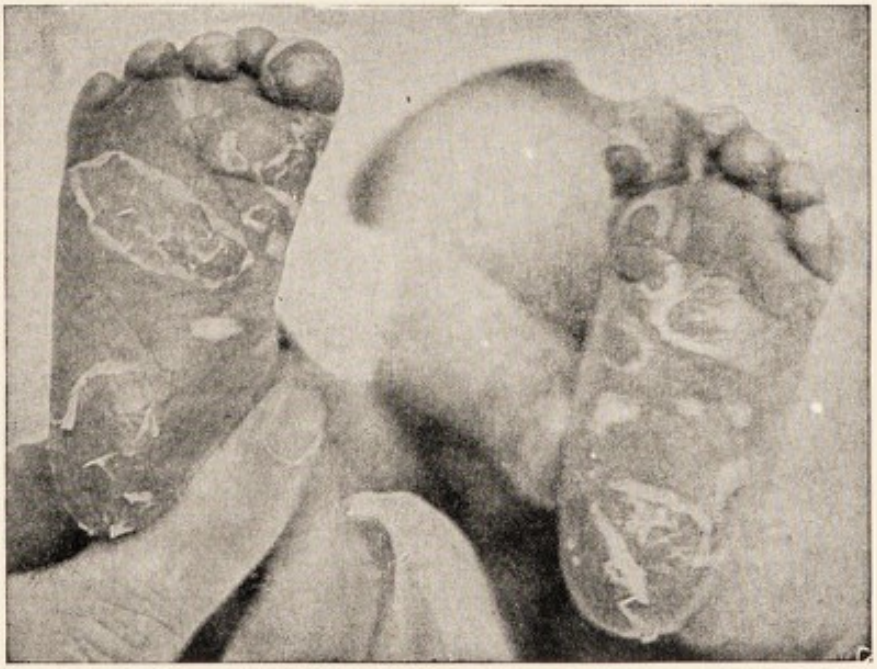

FIG. 23.—Syphilitic eruption of the soles (after pemphigus). Age, three weeks. (Feer's "The Diagnosis of Children's Diseases.")

lenticular, usually discoid, nearly always somewhat scaly, dark ham-red, indurated, and tending to be grouped, as a rule, on the face and in the diaper region, and finally true

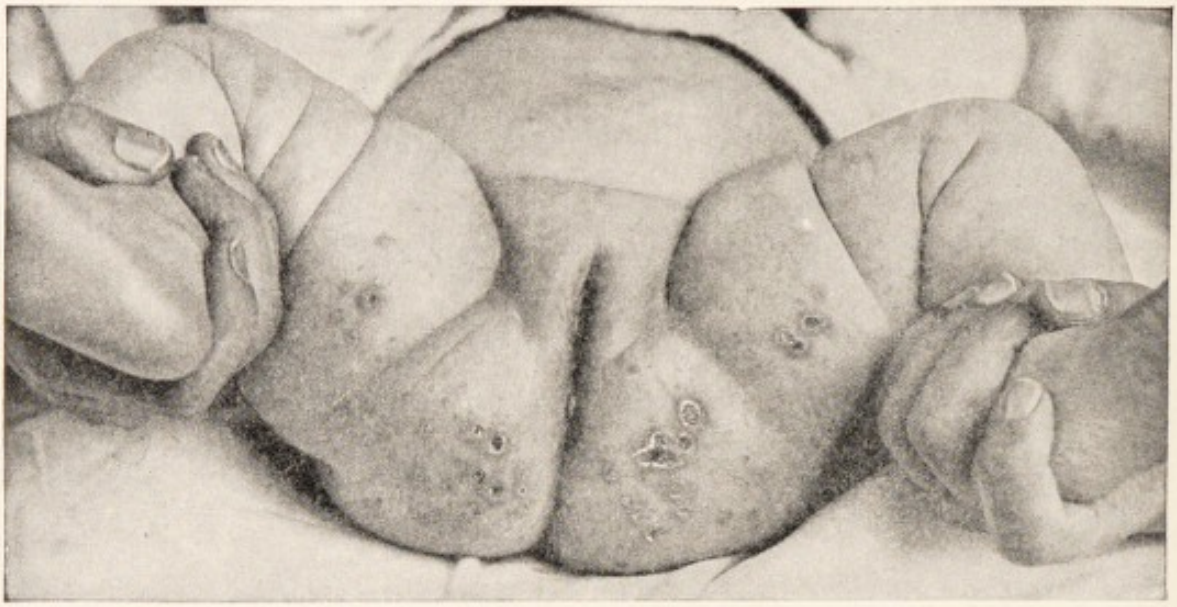

FIG. 24.—Erythema of the gluteal region. (Syphiloid posterosives). Age, five months.

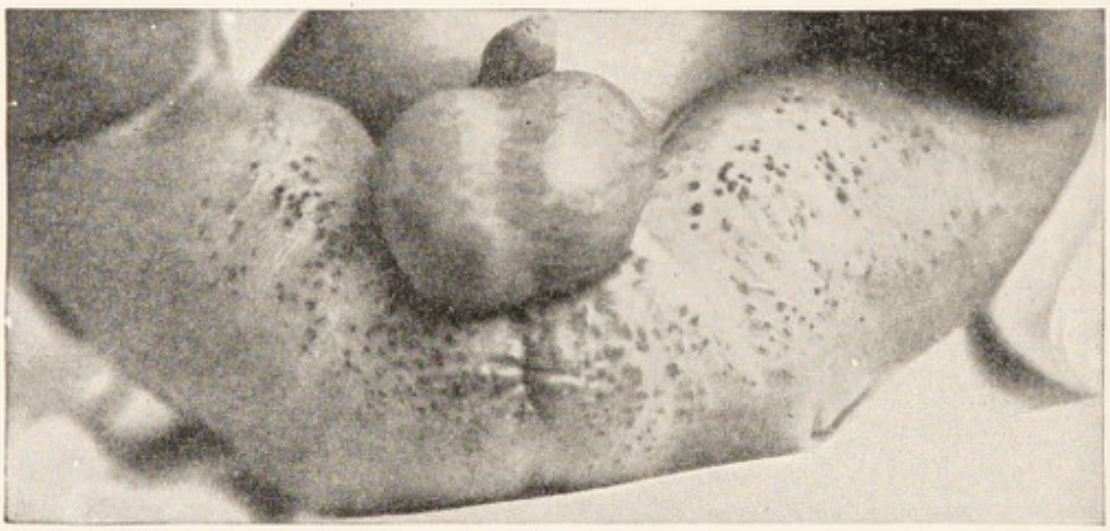

FIG. 25.—Erythema of the gluteal region. Four-month-old infant. Red, markedly raised papules, not syphilitic.

condylomata about the anus, vulva, and genitalia in general. In colored children the papules may be typically circinate. There is frequently an alopecia, especially marked where the

hair is rubbed on the pillow. Mucous patches are common, and all the other signs of syphilis, or any combination of them, may occur. (Figs. 19, 20, 21, and 22). The Wassermann reaction is not reliable in the first three months of life, but its place is taken by the typical findings in the bones of the hands and feet on X-ray plates, showing osteochondritis of the long bones.

Treatment.—It is my firm conviction that these cases should always be started on mercury therapy. Aside from this and the fact that treatment must be carried on intermittently over a period of at least three years, and observation continued to adult life, the problems are no materially different from those of acquired syphilis.

Many illustrations accompanying this chapter have been taken from the extensive collection of photographs in the possession of Dr. H. H. Hazen, of Washington, D. C. My sincere thanks are due him for permission to make use of them here.

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CHAPTER VII

ACUTE INFECTIONS IN THE NEW-BORN

By JOHN A. FOOTE

Conjunctivitis and Otitis

Conjunctivitis.—Non-infectious congestion and inflammation of the conjunctiva are frequently seen as a result of birth injury and of spontaneous hemorrhage, especially in premature infants. Various writers have described conjunctival and even retinal hemorrhages as occurring in the new-born. By far the most frequent and most injurious type of infectious conjunctivitis seen at this time is caused by the gonococcus. Other pathogenic bacteria, especially the pneumococcus, staphylococcus and streptococcus found in the secretions of the birth-canal of the mother may cause purulent conjunctivitis, but such infections are usually secondary to trauma, even though the injury be of slight degree. After the first week of life the child may injure the eyes by purposeless waving movements of the arms and hands which many infants indulge in while crying. The effect of injury in predisposing toward infection is obvious, and even the gonorrheal type of conjunctivitis has been observed to occur with greater frequency where trauma has occurred, as in face presentations, or contracted pelves, or where forceps application has forced the eyes open.

Gonorrheal Conjunctivitis.—It is a safe rule to consider all conjunctival infections to be of a gonorrheal nature until the bacteriological finding has been repeatedly negative.

Usually the infection occurs within the birth canal, perhaps

when the child first opens his eyelids, although in premature rupture of the membranes intrauterine infection may occur and the child may be born with blennorrhea. Usually within three days redness and discharge are noticed. If symptoms do not appear until after the fourth day, it is very probable that infection occurred after delivery.

The symptoms at first are slight redness and swelling of the palpebral conjunctiva, followed by infection of the ocular conjunctiva. Very soon a thick creamy pus exudes between the lids and the latter become so œdematous that the eyelids are closed. Frequently both eyes are affected, either together or serially. Marked inflammation and œdema of the ocular conjunctiva appears early in severe cases, followed by ulceration of the cornea. The course of the disease may be either mild or severe. Rarely, rapid and fulminating progress occurs regardless of all treatment, with deep ulceration and panophthalmitis. The acute symptoms usually last somewhat less than a week, but most cases require treatment for at least three weeks, and some for a couple of months. The corneal involvement with keratitis is always a serious phase, and may require prolonged treatment. Gonorrheal arthritis or gonorrheal septicemia have been known to follow such eye infections.

Prophylaxis of the Eyes of the New-Born

This is the most effectual treatment of conjunctivitis in the new-born. Crede's original method consists in cleansing the eyelids with fresh water to remove mucus; then separating the lids with two fingers and placing on the cornea of each eye one drop of a two per cent solution of nitrate of silver, using as a dropper a small glass rod about 3 mm. in thickness.

The solution should be freshly prepared and kept in a dark bottle with a ground glass stopper.

A "nitrate of silver catarrh" usually appears within 24 to 36 hours, manifested by redness, swelling and sometimes even purulent secretion. This is not an indication to repeat the instillation.

Many obstetricians believe that a 1 per cent solution of nitrate of silver is sufficiently potent if care is taken to see that it actually falls on the cornea. Many albuminate silver compounds, as well as other remedies of the dye group have been employed for their less irritating properties. Five to 10 per cent protargol, 20 per cent argyrol, 2 per cent mercurochrome, etc.

Failures in Prophylaxis

Failure to obtain prophylaxis, whatever solution is used, are due to one of the following errors:

1. Failure to *cleanse the eyes* properly at first.
2. Failure to *separate the lids* so that the solution actually gets into the child's conjunctival sac.
3. Failure to *use freshly made solution*—not more than 48 hours old.

Treatment of Acute Gonorrheal Conjunctivitis.—Treatment should be directed toward (1) keeping the other eye from infection if only one is involved, and (2) cleansing and disinfecting the affected eye.

Usually the sound eye is sealed up with gauze and collodium and a solution of argyrol of 10 per cent strength is instilled twice daily.

The affected eye should be washed every hour or even more often with warm normal salt solution or boric acid solution. A 1 per cent solution of silver nitrate should be dropped in the eye once or twice daily, or a 20 per cent solution of

argyrol should be used every three hours. If much swelling of the lids has occurred cold compresses may be used at first, but are not advisable if the cornea is involved.

The prognosis as to vision depends upon the degree to which corneal ulcerations have occurred.

The treatment of other purulent eye infections is much the same—cleansing frequently but using argyrol instead of silver nitrate solution, and instilling the latter about three times daily in the milder cases.

Otitis

Purulent otitis in the the new-born, especially in poorly nourished or premature infants, has been found at autopsy by numerous investigators. It is rarely diagnosed during life because of the great difficulty in seeing the ear drum and interpreting deviations from the normal appearance in the new-born infant. However, with a special small self-illuminating ear speculum it is possible to see the ear drum in these infants, and in a restless, crying, infant with some fever, an unusually red or bulging ear drum should be promptly incised. The difference between the appearance of the tympanum of the new-born and the older child should be well observed in normal children before paracentesis is attempted. The close apposition of the anterior and posterior walls of the meatus, and the sloping manner in which the tympanum merges with the floor of the meatus, as well as the more red color and greater vascularity of the tympanum in the new-born are points to be observed and remembered.

Having discovered the gonococcus in discharges from both the ear and the nose of the new-born, and other ordinary pus-cocci as well. The writer found the B. Friedlander in one case of suppurative otitis of the new-born.

Any new-born child who seems in pain and cries vociferously within the first week of life should have his ears examined. Many a so-called case of colic will be found to be otitis.

Infants much debilitated may develop a purulent discharge from the tympanum without fever. After paracentesis or rupture the treatment consists of syringing the affected ear with warm normal salt solution, then drying and instilling one or two per cent solution of mercurochrome, or one or two drops of diluted alcohol, several times a day.

Umbilical Infections and Anomalies

Harmless anomalies of the cord are seen as the *skin navel* in which the skin overlies the cord so as to form an eminence at the top of which the umbilical wound is seen, or the *amniotic navel* in which the amniotic sheath of the cord spreads out at the base of the cord so as to involve an area sometimes two inches in diameter on which there is no skin. These require no treatment except aseptic care. *Congenital hernia at the umbilical opening,* manifested by persistence or the fœtal umbilical hernia, and manifested by a large pellucid tumor containing intestine and other viscera, is sometimes seen. Rarely a small tumor is present, and obstetricians have on occasion tied this tumor off and produced gangrene of the intestine as a result. Prompt and early laparotomy, with reposition of contents and suture of skin, is the only possible treatment. General peritonitis results if this is not done.

Other Umbilical Abnormalities

Other abnormal conditions are brought about through *persistence of the omphalomesenteric duct*—a patent Meckel's diverticulum passing from the umbilical site to the ileum. A persistent oozing of cloudy fluid from an umbilical

fistula should suggest chemical and microscopic examination to determine whether or not the exudate is intestinal fluid. Sometimes diverticulæ are open at the umbilicus but closed at the intestinal end, and in these secretion is more scanty. Radical surgical treatment is advisable.

Urachal fistula—a fistula connecting with the bladder and due to urachal persistence, is sometimes found. The fluid exudate when examined chemically shows uric acid as a constituent. Phimosis, congenital urethral stricture, etc., sometimes cause this condition. Removal of obstruction to urine flow and cauterization of the fistula, possibly assisted by freshening the fistulous edges and suturing them, is the proper treatment.

Infections of the Umbilicus

Umbilical infections are important because they are the most frequent and apparent cause of sepsis of the new-born. The fact that both the umbilical artery and the umbilical vein contain thrombi, and so furnish unusually good culture media for pathogenic organisms, makes the toilet of the cord a very important measure for prevention of disease in the new-born.

Delay in separation of the cord, especially if fever is present, is a suspicious circumstance. The stump, if normal, separates on the fifth or sixth day; the umbilical wound is usually healed within three weeks. Heat and moisture favor infection in the cord. The application of alcohol and sterile powder in delayed separation may be of value.

If temperature rises after the stump has sloughed, with signs of inflammation about the wound, infection may well be suspected.

Sometimes normal healing of the skin occurs with a septic condition deep down in the tissues of the stump.

Gangrene of the stump, or *sphacelus,* is sometimes found after careless handling. Fever and foul odor are the outstanding symptoms; the stump displays signs of gangrene. The dead tissue should be removed by the actual cautery. Dressings saturated with diluted alcohol are afterwards advised. If done early this will promote healing. If neglected, sepsis follows, or the dreaded gangrene of the umbilicus, in which abdominal tissue becomes involved and recovery becomes doubtful.

Blennorrhea, or acutely infected excoriation of the umbilicus, is not uncommon. It may result in (a) subacute ulceration; or (b) an acute omphalitis in which the surrounding tissues of the ring become involved, or (c) an indolent granuloma or fungus of the umbilicus; or (d) a migratory infection with pyemic symptoms—this after the initial lesion has apparently healed. In migratory infection, *arterial thrombosis,* or *periarteritis,* or both, may be present, causing at first inflammation in the preperitoneal space, and later, peritonitis; or more rarely, through rupture of the inflammatory exudate into the umbilical ring, orchitis and inguinal phlegmon. When *venous thrombosis* is present the infection causes purulent peritonitis or hepatitis, and general symptoms appear much more promptly than in simple periarteritis. The wound may show little evidence of this infection, as it may be localized deeply in the lumen of the vein. Septic fever may be the first symptom.

The *diagnosis of blennorrhea,* or simple infection of the umbilicus, rests on the continuous flow of pus from the wound, and often on the formation of fistula-like openings through a periarterial inflammation. Usually drainage is incomplete

because the folds of skin overlap. The *prognosis* is favorable. In *treatment,* packing with gauze is inadvisable, also the use of powder. Sometimes the skin, or the fistula in the stump must be incised to promote drainage. Aspiration of pus with a Bier's pump is also employed. The surrounding skin should be protected by applying Lassar's paste.

Ulceration is treated by measures of ordinary surgical cleanliness. After the secretion has diminished, calomel may be used as a dusting powder.

Granulomata of the umbilicus vary in size from a pea to a filbert. They are round and rough as to surface, usually red in color.

Diagnosis.—Gliomata, enteroteratomata, protruding fistula of the urachus, or *prolapsed omphalomesenteric duct,* may be mistaken for granulomata; but these latter are smooth and glistening and not rough on the surface like granulomata. Perforation of the peritoneum or bowel may follow unguarded attempts to treat radically these latter named conditions.

Treatment.—Granulomata are treated successfully by cauterization with nitrate of silver or trichloracetic acid, or if large, by ligation and removal with scissors. The diagnosis should exclude new growths or urachal protrusion before cutting operations on the umbilicus.

In *omphalitis* the skin and subcutaneous tissue about the umbilical wound is tense and swollen with an advanced cellulitis. The infant holds the abdomen stiff to avoid pain, and breathes with upper part of his chest—the costal type of respiration. The legs are flexed, and fever is present, usually rising with the development of the inflammation.

Treatment.—The treatment consists in the application of compresses wet with hot solution of boric acid, or Dakin's

solution, and changed every half hour. If abscesses form they should be incised and drained.

Provided sepsis does not follow, the prognosis is good.

Sepsis of the New-born

General Bacteremia or General Toxæmia.—Sepsis of the new-born is a term loosely applied to the many obscure general infections or toxæmias which present a varying, or non-typical, clinical picture in the new-born infant. These conditions are the result either of a *bacteremia* in which bacteria are diffused through the blood stream from either a known or an obscure focus of infection, or of a *general toxæmia,* in which not the bacilli themselves, but their toxic products, are diffused from an infected focus. In certain forms of sepsis not only are bacteria found in the blood stream, but also multiple foci of infection are found in various organs and tissues. This constitutes the so-called pyæmic sepsis.

It will be observed therefore, as Von Reuss has pointed out, that the term sepsis of the new-born is loosely used to cover those infectious conditions which present a varying clinical picture, rather than to designate specific general infections such as *typhoid fever.* The pyogenic cocci, the colon bacillus and Friedlander's bacillus are the organisms most frequently found in the blood stream when bacilli are found in sepsis of the new-born.

The mechanism of these septic conditions is not well understood. Reduced resistance is, of course, present in the new-born. Intrauterine infection has been demonstrated, but is rather rare. Infection of the child while in the birth canal is not so uncommon. Besides the umbilical wound,

route infections also occur through the nose, nasopharynx, throat, gastro-intestinal tract, and through skin wounds or minute wounds in any of the mucous surfaces.

This multiplicity of routes may develop a varying picture in focal symptoms. A pharyngitis, an otitis, a stomatitis, a gastro-intestinal infection or some similar lesion may be the starting point; or sepsis may follow a general skin infection such as impetigo, or a diffuse process such as erysipelas. A pneumonic involvement may be the starting point, and most pneumonias of the new-born are septic in type. Meningitis of the new-born, which has been reported as having occurred as early as the first week of life, is usually a focal manifestation of a septicemia or bacteremia. A diagnosis of the focus of origin is frequently impossible. For example, during a so-called influenza epidemic a mother who had the disease gave birth to twins. Both infants developed fever and pharyngitis three days

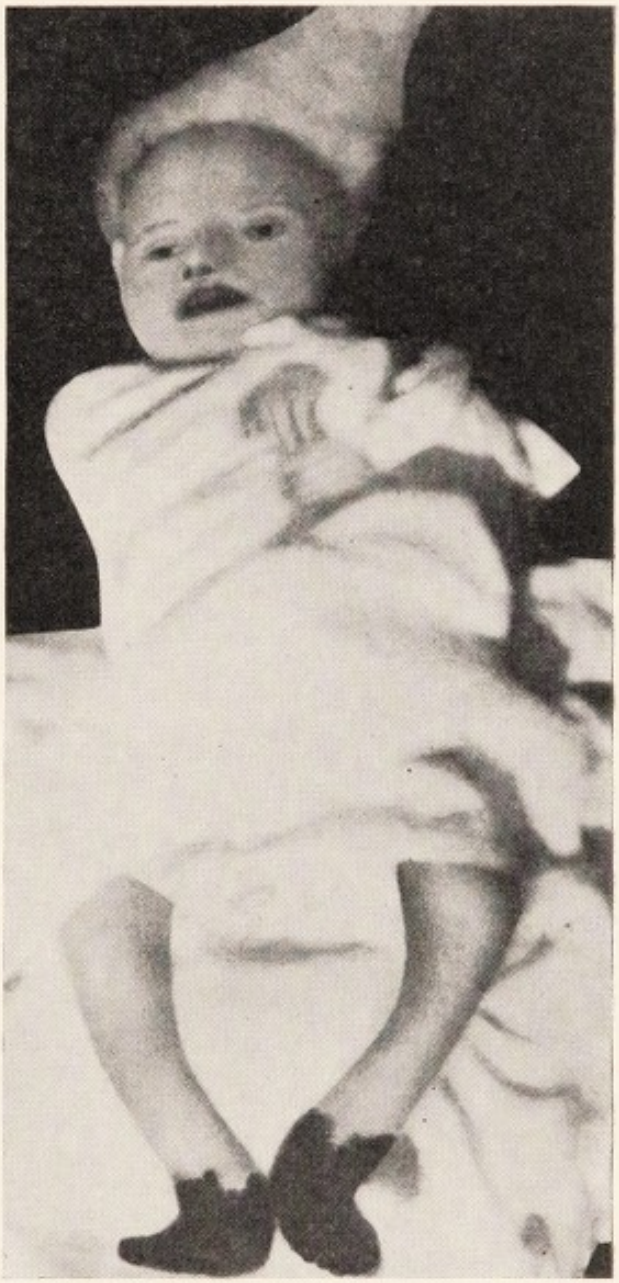


FIG. 26.—Symmetrical gangrene of feet in infant three days old accompanying a Friedländer bacillus infection of the throat. (Foote.)

after birth. One recovered, the other became septic and died of arterial gangrene of both feet after forty-eight hours. (Fig. 26.) I found the B. Friedlander preponderating in cultures from the throats of both children. With the same infection one developed sepsis, the other did not. Individual resistance is therefore a factor of importance.

The diagnosis of sepsis is extremely difficult. In a weak or premature child, the absence of *fever* may be misleading. There may be only a slight rise above the normal, remitting to subnormal. Rigors do not occur, but often intervals of collapse are noticed. Robust infants, however, will often develop typical septic fever with alarmingly low remissions. Glands in the neighborhood of inflammatory foci sometimes do not enlarge; this is noticed in the infections of the throat, axilla and groin. An icteric tinge of the skin is often seen, especially in sepsis from umbilical infection. *Buhl's disease* is a form of sepsis characterized by multiple hemorrhages and fatty degeneration in the parenchymatous organs, such as the liver. *Winkel's disease* is another septic syndrome, with asphyxia, little fever, deep bronze jaundice and hemoglobinuria. The spleen is large, and the visceral pathology resembles Buhl's disease.[1] The kidneys are especially affected. Treatment is in most cases unavailing, and death ensues in from eight hours to two or three days in 82 per cent of the cases.

TREATMENT OF SEPSIS

Treatment of sepsis of the new-born should be first of all preventive. Owing to improved hospital technique the disease is fast disappearing. Treating the new-born as an operative

[1] Fatty degeneration of the new-born, a rare condition, is also believed to be the sequel of a septic condition.

wound would be treated as regards cleanliness; avoiding unnecessary handling of the infant; being careful to wash and disinfect hands before handling the infant, and especially after handling dressings or utensils of the mother—all these measures would help to prevent infection of the new-born. Many cases of sepsis in the infant follow lochial infection or septic endometritis in the mother. If the nurse or mother has even a simple rhinitis or pharyngitis a gauze mask should be worn and the hands washed before handling the infant. Cord wounds should be given aseptic surgical care, and any local abnormalities should be noted and given treatment.

The practice of having only one nurse in a hospital nursery to care for twenty or more infants makes proper technique impossible. One nurse to five infants would be a practical ratio for prevention of sepsis, impetigo, and other infections of the nursery.

The therapeutics of sepsis consists in evacuating local abscesses if, and when, they are found; and usual surgical measures. Breast milk should be obtained and given in small quantities frequently. Often the milk will have to be fed in a Breck feeder; septic infants usually do not nurse. Warm packs for twenty minutes may help to reduce the fever if given every three hours. If the specific organism is found in the blood stream, intravenous therapy may be tried with soluble mercurochrome for the streptococcic and colon infections, or gentian violet in infections caused by gram-positive bacteria as used by Smith and Casparis, using the following proportion:

Soluble Mercurochrome, 3 to 5 mgm. per kilo of body weight.

Gentian violet, 5 to 7.5 mgm. per kilo of body weight.

The injections are given daily, the dyes being dissolved in 5 cc. of fresh double distilled water.

It is advisable to employ the smaller doses at first. Blood transfusion may also be employed,[2] but should be used early. The outlook in sepsis, however, is practically always hopeless.

Respiratory Infections

The occurrence of rhinitis in a new-born infant instantly suggests congenital syphilis. Practically all cases appearing within 72 hours after birth are due to lues. Contact with nasal secretions of other persons, bath water, organisms from the mother or nurse, any of these may cause ordinary non-luetic rhinitis within the first week of life. Acute rhinitis and pharyngitis are much more apt to occur during a so-called influenzal epidemic. The writer has previously spoken of having recovered the Friedlander bacillus from the throat of two twin children who developed pharyngitis on the third day after birth, while the mother was febrile from an attack of "influenza." One of these recovered; the other died with a fulminating arterial gangrene of both feet as a terminal condition. Acute pharyngitis can therefore be the initial focus for septicemia of the new-born, most remarked during the winter months.

Diseases of the paranasal sinuses, especially of the antrum of Highmore, and of the anterior ethmoid cells, have been reported within the first two weeks of life, but are rare. Acute tonsillitis is also uncommon in the new-born.

Retropharyngeal abscess occurs in the course of pyemic infections following umbilical and other lesions, and in weak

[2] Blood washing—the administration of large quantities of citrated blood, while slightly less quantities of the infant's venous blood are simultaneously withdrawn—is a recent innovation.

children may have little accompanying fever. Typical stridulent breathing is noted. Abscess should be located by palpation and then promptly evacuated.

Stridor of the New-Born

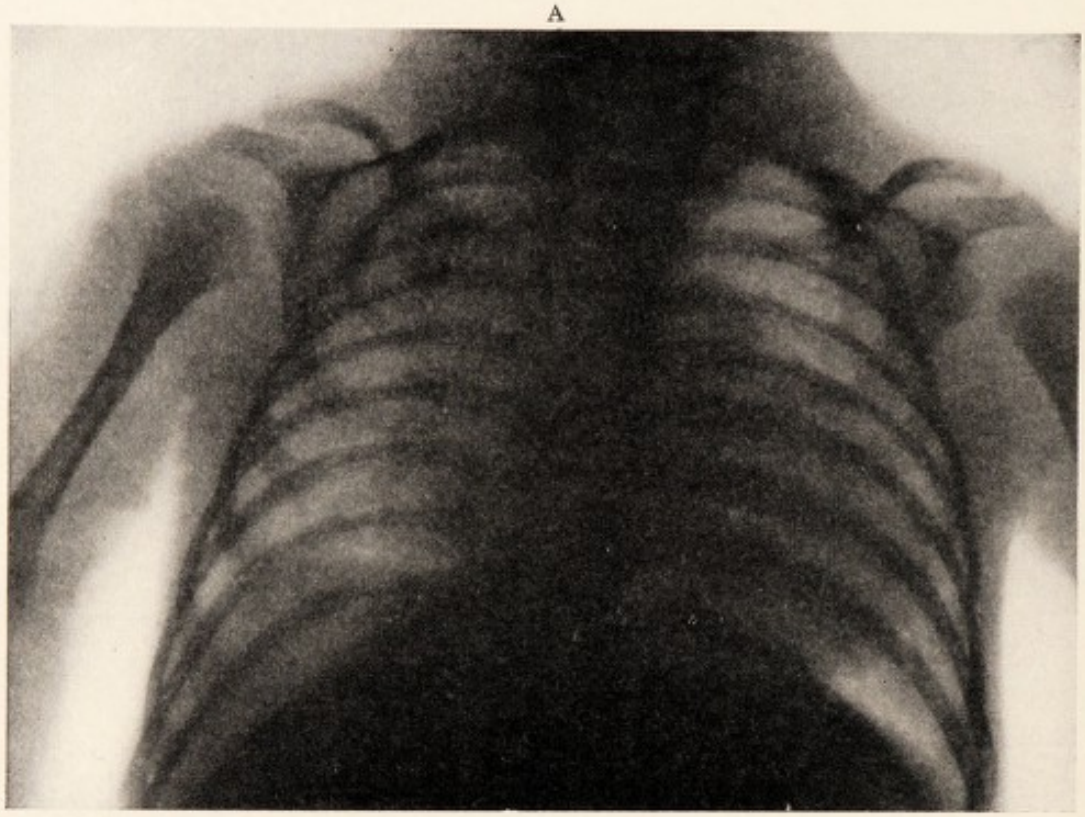
A condition of *inspiratory stridor* appearing within the first day or two of life "stridor of the new-born," has been attributed by Hochsinger to thymic pressure; by other writers to a laryngeal irritability accompanied by a catarrhal infection. This condition usually clears up by the end of the first year. Hochsinger included in this category those cases of stridor which appear even when the child is several months old. I have personally seen a number of such conditions that began after the fourth month, when dentition is progressing, and such cannot properly be classed among diseases of the new-born. Hochsinger's theory that all such stridors are due to thymic pressure has been much disputed. It is maintained and seems well proven, that an enlarged thymic shadow to the right of the vertebral shadow at the second interspace is often seen in children who breathe in a perfectly normal manner. Benjamin and Goett have established this fact. DuBuys and others have recently corroborated this work.

Physiologists have raised the point that in true thymic asthma the stridor should accompany expiration rather than inspiration, since in animal experiments pressure on the trachea produces an expiratory and not an inspiratory asthma.

This stridor does not usually assume much importance until an upper respiratory infection occurs. Blueness and marked dyspnœa then appear to an alarming degree, and fatalities have been known to occur at such times.

Pneumonia of the new-born, which begins as a pharyn-

A



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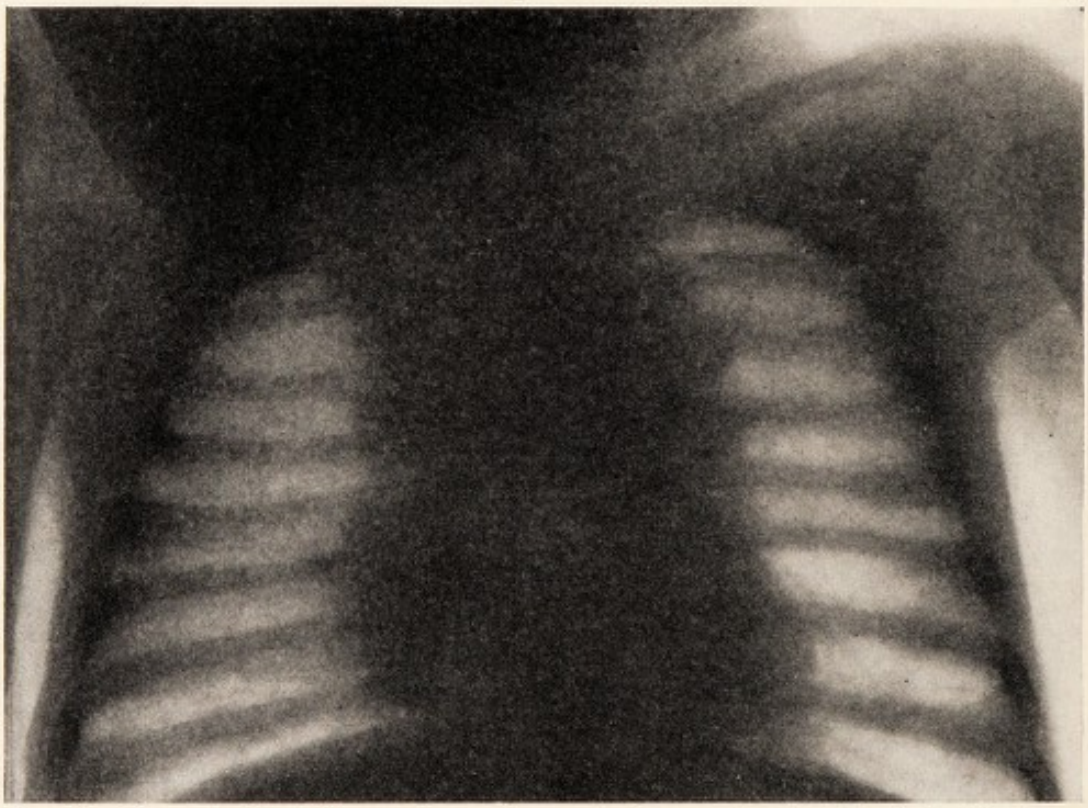

FIG. 27.—Hypertrophy of thymus in new-born. A. In premature infant. B. In infant one week old. Children's Hospital, Washington, D. C.

gitis, is in reality a general septicemia, causing death before local signs appear. It is usually not diagnosed during life. Fever, irregular breathing and cyanosis, with no distinctive signs on physical examination of the chest make the symptom complex a puzzling one. Reference has been made to this condition on page 56. It is a frequent cause of infant deaths, as has been shown by McCrae in the autopsy reports on new-born children at Montreal General Hospital.

Treatment.—The treatment of rhinitis consists of dropping in the nostrils a very weak solution of adrenalin (1 to 6000) with 1 grain of novocaine in each ounce, every three hours, perhaps followed by a drop of a ten per cent solution of argyrol or neosilvol. This is also advisable in acute pharyngitis of the new-born.

Congenital stridor, of slight degree, requires no treatment. Occasionally a local cause may be found, as laryngeal deformity or a new growth, but more frequently no such cause is demonstrable. If a very large thymic shadow is shown in the X-ray plates, then treatment by X-ray may be undertaken, though in my personal experience such treatment, although efficient in decreasing thymic shadow, is sometimes not helpful in relieving symptoms.

Sedative doses of bromide of soda, ¼ to ½ grain may be useful in pronounced cases. Though the signs of tetany are not found in this form of stridor, some success in relief of symptoms has been reported with the use of cod-liver oil 15 drops, and phosphorus 1/1000 grain, in children over three months of age.

If *rhinitis* or *catarrhal pharyngitis* is also present, the use of the adrenalin-novocaine solution is indicated. In extreme

cases in older children intubation may be needed as a life-saving measure, although as a result such children may become chronic tube addicts.

Albuminuria, Pyelitis and Nephritis

Albumin and red blood cells are sometimes seen in the urine of the new-born child within the first few days of life, and at this time may have no pathological significance. Nephritis of an acute type, and pyelonephrosis, do occur in new-born infants and are probably the result of infection elsewhere, or of general sepsis. The frequency of primary congenital syphilitic nephritis is not properly appreciated, perhaps because of the impression that kidney changes in congenital syphilis are almost invariably the sequelæ of mercurial treatment. But we have seen primary diffuse nephritis, with œdema, occurring in a syphilitic infant less than two months old, which had never been treated for syphilis.

That nephritis from other causes is seen in the new-born is shown by Mensi, who reported seventeen patients, not syphilitic, from ten to fourteen days old, in all of which blood casts and albumin were found in the urine following infection of the digestive tract.

Grulee found that the child born of a nephritic mother had a special tendency toward kidney inflammation. Abt's summary of pathological findings in children born of nephritic mothers seems to confirm this probability. Such children should be carefully watched for symptoms of kidney infection or toxæmia.

A form of congenital hæmaturia which seems to be hereditary and familial has been described, and may be confusing, but it is akin to the paroxysmal hemoglobinuria of adults

and tends to rapid recovery. This should not be confused with Winckel's disease, in which severe icterus and cyanosis are noted over the skin of the body.

Congenital polycystic kidneys and stone in the kidney of the new-born are not unknown diseases in the first weeks of life.

Lack of urination in the new-born may be due to (1) lack of fluid intake (especially in breast babies); (2) mechanical obstruction through malformation or through imperforate prepuce or urethra; (3) actual organic defect or inflammation of the kidney itself.

The bladder is an abdominal organ in the new-born, and if mechanical obstruction is present it should be easily palpated. A very small catheter, such as a ureteral catheter, can be used to catheterize the new-born to determine urethral patency. (See page 168.) Partial circumcision is sometimes, though rarely, required to relieve preputial constriction.

The diagnosis of nephritis, pyelitis or pyelonephrosis rests upon the urinary analysis. In much depleted infants the febrile course may be atypical. Robust infants, however, usually develop typical high temperature when the pelvis of the kidney is involved.

The treatment consists in administration of fluid, usually mild alkalies, control of temperature by warm packs, and the use of breast milk. Severe anemia usually accompanies or follows kidney infections in the infant, and transfusion is a valuable remedy in this event.

Peritonitis

Peritonitis is not uncommon in wasted and athreptic infants during the first weeks of life. It usually follows umbilical-vein infection or colitis, and may occur in depleted

infants after the operation for pyloric stenosis. Denzer aspirated pus from the peritoneum of a number of athreptic infants who had few typical symptoms. We have had in our clinic a number of such patients, who did not show the progressive symptomatic changes such as vomiting, tumor, muscle spasm and intense pain, but who showed at autopsy a low grade peritonitis. This we have designated as the *static* form of peritonitis. It is usually fatal, and is a terminal state of athrepsia.

A number of acute appendicial abscess cases have been noted in the new-born, which were probably fœtal appendicitis, and it should be remembered that here too, neither muscle spasm, rigidity, febrile reaction nor distension may correspond to type, especially in wasted infants. Vomiting, however, is usually present to some degree.

Early diagnosis and operation offers the only hope in such infants, who are usually very toxic and have a grave prognosis.

In athreptic infants who show progressive deterioration, salt solution is frequently administered by the intraperitoneal route. When after such administration a gain of weight is shown over a period of 24 hours with all the other symptoms becoming progressively worse, it means that the peritoneum has ceased to absorb. Autopsy in such instances at the Washington Children's Hospital has invariably revealed static peritonitis.

We may reasonably conclude that a gain of weight lasting 24 hours after the administration of intraperitoneal salt solution to an athreptic infant with slight vomiting, with progressive deterioration in turgor, pulse, etc., may be regarded as a sign of peritonitis, even though other symptoms are absent.

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CHAPTER VIII

ERYSIPELAS, EXANTHEMATA, TETANUS

By JOHN A. FOOTE

THE origin of the very fatal form of erysipelas which occurs in the new-born is sometimes not traceable. Kaltinbach observed that the children of some mothers, who had erysipelas a few weeks before delivery, were born with a diffuse desquamative condition of the skin, indicating intrauterine recovery from the disease.

Certain children of mothers who had septic metritis during labor have been found to develop erysipelas within a day or two after delivery. Of course the disease is very contagious, and post-partum erysipelas in the mother is certain to be followed by an infection in the child.

Erysipelas is essentially a form of sepsis caused by a streptococcus. Its portal of entry is most frequently the umbilical wound, or the cord, although minute abrasions anywhere on the body may allow the initial lesion to develop. Von Reuss finds that the lower half of the body is more frequently affected than the upper half, and the genital region is often the starting point of the eruption which progresses downward rather than upward.

The disease usually begins at the end of the first week, and from the first up to the third week is the usual time for its inception.

The eruption is deep red, but the line of demarcation is not so noticeable as in the adult, and more œdema is present. Vesiculation is abundant, and gangrene of the scrotum and of the female genitals is a common occurrence. Ulceration

and abscess formation also occur. The temperature is very high, and may have critical depressions due to collapse. The disease is usually fulminant in its progress, and death usually takes place in a few days, although recovery in the new-born has been reported.

The treatment consists of (1) general warm body packs to control septic fever; (2) continuous application over affected areas of thick compresses of gauze saturated with hot fluid to aid in local hyperæmia—a saturated solution of magnesium sulphate is perhaps best for this purpose; (3) the giving of small quantities of diluted breast milk by means of a Breck feeder; (4) stimulation by means of 10 drops of whisky properly diluted and given by mouth, and hypodermic injections of 1/500 grain of strychnine sulphate, administered every three hours, or at the periods of temperature remission.

Transfusion to Offset the Extreme Anemia.—The use of ichthyol, of painting the skin with tincture of iodine, of compresses of diluted lead water, or solution of aluminum acetate —all these methods have their advocates and champions. Specific treatment by vaccines or serums has not been proven effectual so far. Blood transfusion, if employed, should be used very early in the disease to be beneficial. Massive transfusion with withdrawal at the same time of slightly less amounts of the patient's blood has been advocated.

CONTAGIOUS DISEASES

The *eruptive diseases* are not so frequently found in the new-born as they are in older children, excepting perhaps the epidemic form of small-pox and varicella. Instances are on record in which mothers suffering from small-pox, for example, have given birth to children who showed variola scars. Varicella, measles and scarlet fever have all been

described as occurring in the new-born child at a period so early as to prove an intrauterine infection.

Vaccinia

A relative immunity of the new-born to the effects of *vaccination* when the mother has been recently vaccinated is quite well established. The clinical and experimental work done so far suggests that the partial immunity of the new-born to certain contagious diseases is due to (1) heredity; (2) intrauterine, active or passive, immunity from the mother; (3) defensive substances in the mother's milk.

The new-born child reacts in a different manner and less acutely to vaccination than the older child, and this bears no relation to vaccination in the mother. But the new-born infant contracts small-pox very readily, and the disease is fatal in most new-borns when it has been contracted during epidemics.

Measles

Children rarely contract *measles* during the first month of life; numerous cases are on record in which a mother with measles has given birth to an infant who did not contract the disease. Susceptibility to infection increases from the first month onward. Breast-fed babies have a more prolonged immunity than those fed artificially.

The *diagnosis* of measles in the very young should not be made on the eruption alone, as many eruptions of an erythematous type resembling measles and scarlet fever are seen in new-born children. Koplik's spots, fever, and catarrhal symptoms should be looked for to confirm the diagnosis of measles when a morbilliform eruption is seen.

The relative immunity of the new-born to measles should

not be taken to mean that the new-born should be freely exposed to the disease. When such an infant does contract measles, he is usually very ill, and many clinicians do not approve of the proposal to expose all infants to such infection, which is advocated by some authorities. But when the mother develops measles during labor, exposure is so certain that the infant need not be prevented from nursing the mother.

Chicken-Pox

Varicella, or *chicken-pox,* rarely occurs during the first two weeks of life, but new-born infants readily contract it after that period. The susceptibility of the new-born to rubella, or *German measles,* is absent or very slight, according to various authorities.

Scarlet Fever

As to *scarlet fever,* Escherich and Schick are certain that the reports of early cases of this disease in the new-born are due to mistakes in diagnosis. The youngest child they could find with the disease was four months old. Wet nurses and mothers with scarlet fever are known to have suckled children all during the course of the disease (Salge) without infecting their infants. Zingher's work with the Dick skin test indicates that many new-born children are immune to scarlet fever. The development of a specific serum (Dick and Dochez) has simplified both immunization and treatment, as well as diagnosis. Intradermal injection of the specific serum will blanch a true scarlatinal eruption in 24 hours.

Pertussis

Pertussis is extremely rare in the first two weeks of life. Less than half a dozen authentic cases are on record, although it frequently occurs after the second week. This disease is

dangerous in the new-born, pneumonia is a frequent complication, and a guarded prognosis should be made. A light binder of heavy muslin from the nipples to the scrotum will support the abdominal muscles and facilitate coughing. Congenital bronchiectasis has been mistaken for whooping cough in the new-born, but can be differentiated by the X-ray plate.

Treatment.—The infant should be strictly isolated if in a house where other inmates have this disease. If a nursing mother contracts pertussis she should wear a heavy gauze mask while in the same room with the infant, and should wash her hands before touching the baby. What is true of pertussis as to incidence and preventive measures applies also to influenza and all grippal colds.

Diphtheria

In *diphtheria* of the new-born the earliest cases have been seen on the sixth day. Schick's tests on the new-born reveal that 93 per cent possess a natural immunity. This gradually disappears until at one year only 60 per cent are immune. Nasal diphtheria is more frequently seen in the very young than the faucial type. Nipple cracks containing diphtheria bacilli have been found in some cases to be the cause of the infection, although infection through maternal or other carriers cannot be excluded.

When a nursing mother contracts diphtheria, the Schick test should be made immediately on the infant. If it is negative, then breast feeding may be continued. If not, an immunizing dose of antitoxin may be given, 300 to 500 units, to be followed by toxin-antitoxin immunization. When clinical diphtheria is diagnosed in the new-born vigorous treat-

ment should be instituted. At least 2000 units of antitoxin should be given at once without waiting for bacteriological diagnosis.

Diagnosis.—Care should be taken to exclude false diphtheria, such as Bednar's aphthæ or pterygoid ulcer, and Epstein's pseudo-diphtheria, both conditions peculiar to the new-born, being due to trauma to the palate, the former occurring shortly after birth, the latter at a later period from too vigorous mouth cleansing. These two conditions are ulcerations, seen at the palate with a whitish membrane, and easily curable by application of 5 per cent solution of silver nitrate. Fever is absent. The bacteriologic examination makes the differential diagnosis from these conditions a simple matter.

Mumps

Epidemic parotitis, or mumps, is very rarely found in the new-born. Cases have been reported as occurring within a week after birth, which would indicate an intrauterine infection, but the statistics of Sperk give only two cases in infants, one of these during the first month of life.

Typhoid Fever

Typhoid fever and other diseases of the colon-typhoid group are relatively mild in the young infant. Intrauterine infection has been proven to have occurred, but, as is well known, healthy children have been born of typhoidal mothers. Hemorrhages and other complications are rare in infants. Breast milk feeding may be continued if the mother's condition permits, although expression and boiling of the breast milk should be obligatory.

Tetanus

Tetanus neonatorum has become a rare disease in the United States owing no doubt to the care given the umbilical cord after labor. In certain tropical countries where poor hygiene prevails, as many as 40 per cent of all new-born infants die of this disease. Infection nearly always occurs through the umbilical stump, and the bacillus is found in the

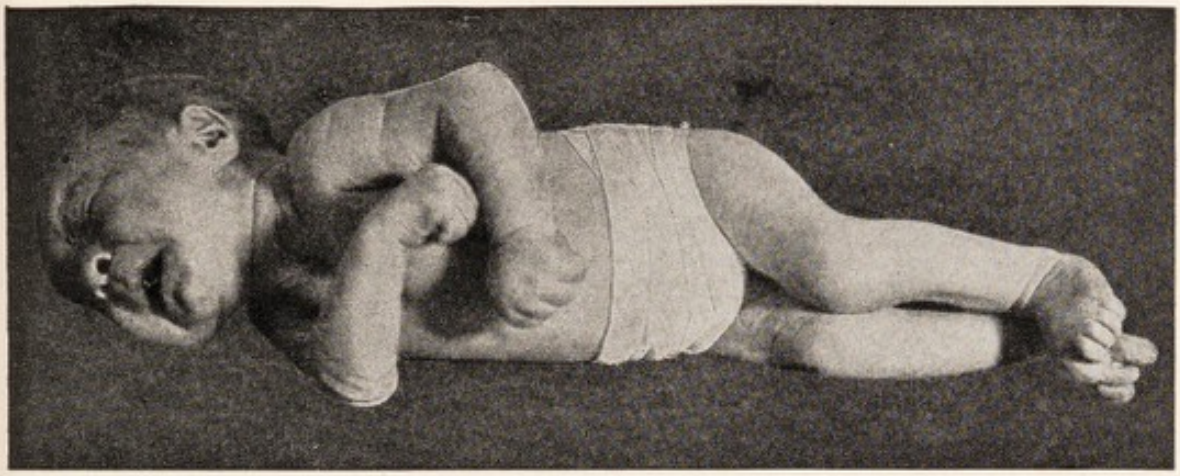

Fig. 28.—Tetanus neonatorum. The picture was taken during a convulsion. (Feer's "The Diagnosis of Children's Diseases.")

soil, house dust, etc. The time at which the disease appears is usually at the end of the first or during the second week of life. Incubation varies from two days to three weeks.

Symptoms.—Trismus or spasm of the jaw is the first symptom which often comes after a day of restlessness or crying. Spasm of the jaw prevents the infant from sucking either the breast or the bottle. The masseters become rigid and the jaw is tightly closed. Spasm of the other facial muscles, wrinkled brow, sardonic grin, etc., soon appear, and sometimes a snout-like protrusion of the mouth is seen as a result of facial spasm.

Arms, legs, abdominal walls—all eventually become involved in the tonic spasms, and opisthotonos is a later manifestation. These contractions come on at intervals and are

intensified by manipulation or by noises. Fever may be high or may be absent. It is sometimes very high, with conspicuous remissions.

Prognosis.—The disease varies in virulence and is sometimes mild. Its duration is from a few hours to several days—usually at least two days. Milder cases are protracted. Foreign observers report the mortality to vary from 40 per cent to 98 per cent. The prognosis is therefore far from hopeful. The patient should be kept absolutely quiet in a dark room, and be disturbed as little as possible.

Treatment.—The usual therapeutic treatment consists in injection of anti-tetanic serum, 250 units under the skin in the lumbar region and 250 units intraspinally—the latter after lumbar puncture and withdrawal of fluid. This should be repeated at intervals of eight hours for at least six doses. Other measures consist in giving 5 grains of chloral hydrate in ½ an ounce of water by rectum, every three hours, to control spasm. Feeding should be conducted by means of a small catheter passed through the nose into the stomach at regular intervals. Protracted cases often die for want of food.

If food is not well taken, intraperitoneal injections of normal salt solution may furnish the needed fluid to the body and help to sustain life.

If the child survives for a week, the symptoms usually abate and a better prognosis is assured.

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CHAPTER IX

CHRONIC INFECTIONS IN THE NEW-BORN

By JOHN A. FOOTE

Syphilis and Tuberculosis

Tuberculosis.—True *hereditary tuberculosis* is a very rare disease, although authentic cases are on record. Tuberculosis of the placenta has been well studied, and tuberculous lesions have been found in the dead fœtuses of such mothers. It can be said, therefore, that intrauterine infection with tuberculosis can and does take place, though rarely. Much more frequently is the congenital tuberculosis, so-called, in which infection occurs at the time of, or shortly after birth. Tuberculosis has been observed to develop with great rapidity in the children of mothers in the last stages of tuberculosis who died in labor, and whose infants therefore were never in contact with the mother after birth. But by far the most frequently found route of infection is the respiratory tract —by inhalation of infected droplets from the breath of infected individuals.

Every infant of a mother with open tuberculosis should be absolutely separated from the mother if infection is to be avoided.

Tuberculosis in the new-born is usually miliary in type, with slightly raised temperature and a primary lesion in the lung. The prognosis is hopeless.

Syphilis

Hereditary or *congenital syphilis*, in contrast with tuberculosis, is a rather common disease. The skin lesions of this disease have been described on page 77.

Whether or not mothers free from symptoms of the disease really have syphilis is a mooted question. Some authorities, following Hochsinger, assert that the positive Wassermann found in 57 to 100 per cent of such women is not actual evidence of syphilis, but rather is due to immune bodies transmitted to the maternal circulation by the infected fœtus.

Many children, according to Reitschel, are born with some immunity, although the spirochetes are present in the tissues at birth. The parasites proceed to produce an infection as soon as the slight immunity of the infant disappears. This is an ingenious effort to explain why symptoms frequently do not appear until a couple of weeks after birth.

We will discuss here only such lesions as appear in the new-born. The skin lesions have already been considered. Next to some form of skin eruption, snuffles is the most frequently seen early sign of the disease. In Findlay's cases it appeared before the rash, and at the same time as the rash in an equal number of cases. It is rare indeed that the eruption is present at birth. It usually appears between the third and tenth week, sometimes not till the third or fourth month.

Onychia, or inflammation of the nails, is said to be rare. I have seen it, however, associated with pemphigus-like lesions at the third week. In this case the snuffles were associated with an acute pharyngitis and otitis and rather high fever. Snuffles may become eventually a lesion of the osseous system —causing perichondritis of the nasal frame.

Hacking of the lips, or loss of the line of demarcation—the so-called rhagades—is also sometimes seen early in the disease. *Laryngitis,* or aphonia, and a persistent fermentative diarrhœa are frequently found associated with other symptoms.

Lesions Commonly Found at First

Certain other lesions commonly present in the first month of life in congenital syphilis are:

1. Enlargement of the spleen of moderate degree.
2. Enlargement of the superficial lymphatic glands, especially the epitrochlear glands (usually considered of great diagnostic importance).
3. Slight enlargement of the liver, evidenced by palpation of its edge more than a finger's breadth below the costal margin in the mammary line.
4. Lesions of the bony skeleton—epiphysitis or periosteitis or perichondritis.

Bone Lesions in Early Syphilis

Bone inflammations are a very common sign in congenital syphilis. At the Children's Hospital, in Washington, we have been making routine X-ray plates of all children brought to the Congenital Syphilis Clinics, and it is notable that osteochondritis of the epiphysis of the bones is more likely to be found within the first month or two, after other symptoms appear, than later. This coincides with the observations made by Findlay.

Next in frequency to inflammation in the radius and the ulna, the humerus is involved. Frequently no local symptoms are present, and the X-ray is utilized to show the infection. But in numerous cases the infant is brought to the hospital for a supposed paralysis of the arm, and it is found that he is suffering from a syphilitic bone lesion. (Fig. 29.) This pseudoparalysis, described first by Parrot, is an inflammation of the epiphysis. It must be differentiated from

(1) Erb's paralysis; (2) scurvy, and (3) acute poliomyelitis. Scurvy, and the pathological fractures of rickets are sometimes associated, and rachitic fractures of themselves will frequently simulate paralysis. Moser's scurvy-rickets patient with eleven pathological fractures is interesting in this con-

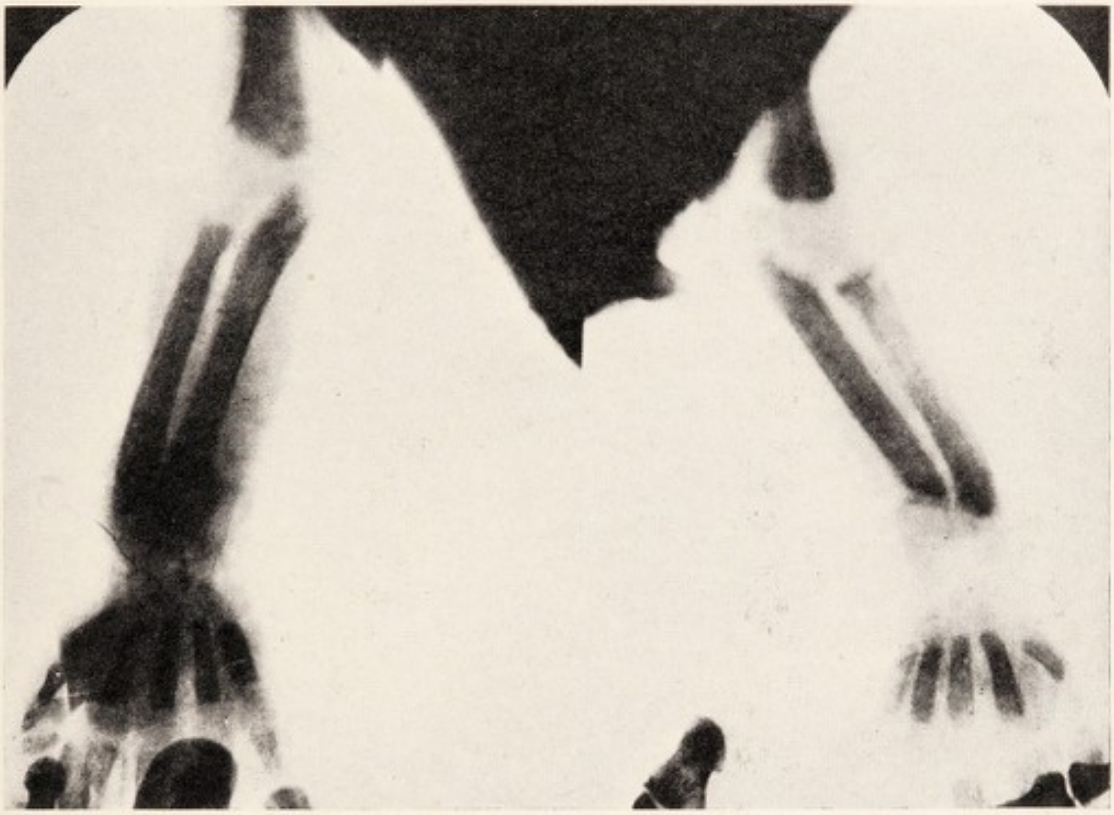

Fig. 29.—Syphilitic epiphysitis with rickets.

nection. (Fig. 30.) But such non-syphilitic pseudoparalytic conditions rarely appear earlier than the first four or five months of life. Findlay says: "It may be taken as an axiom that loss of power of a limb in an infant under six months of age is due to syphilitic osteitis.

Dactylitis is not usually found so early in life as epiphysitis. It is difficult, sometimes, in younger children, to differentiate syphilitic dactylitis from the tubercular variety. (Fig. 31.) Sometimes, though rarely, the Wassermann

reaction is absent in hereditary lues; it is in such cases that diagnosis of bone lesions become extremely difficult, although at the Children's Hospital, in Washington, we found the Wassermann reaction positive in 93 per cent of children showing any clinical symptoms of the disease. In one case, a two

FIG. 30.—Multiple fractures in prematurity with rickets and scurvy. Eleven fractures were found in this infant. Osteogenesis imperfecta was excluded. (Dr. J. M. Moser.)

year old colored child, a typical syphilitic dactylitis was present. The X-ray showed that the bone lesions were characteristic of syphilis, but that the lungs showed an area typical of tuberculosis. The Wassermann reaction was repeatedly negative, but the lesion cleared up under treatment with arsenic and mercury.

These early bone lesions of syphilis must not be confused with late bone lesions, which come well after the fifth year.

Fig. 31.—Syphilitic dactylitis, three months old. Children's Hospital, Washington, D. C.

Histories of several cases of this type of osteoperiosteitis are given in the article by Dembo, Litchfield and Foote.

Ong and Selinger, analyzing 200 typical cases at all ages at our clinic, found joint and bone lesions, including dactylitis and saddle nose, to average 43 per cent, while skin lesions were seen in 84 per cent of all cases.

In discussing the *treatment of syphilis* in the chapter on "Skin Diseases," Eichenlaub suggests the early use of mercury.

The Treatment of Syphilis

The *treatment* should be promptly instituted, and consists of mercurial inunctions and the administration of arsphenamin or neo-arsphenamin. We have seen excellent results from weekly injections of neo-arsphenamin (intravenous), mercurial inunctions applied three times weekly during alternate weeks, and rarely intramuscular injections of mercuric chloride. The injections of mercuric chloride are likely to cause pain and induration, and we have practically abandoned them in favor of inunction. The neo-arsphenamin was given in the dose of 15 mg. per kilogram of body weight, dissolved in 1 cc. of double distilled water per kilo of body weight; the mercuric chloride in the dose of ½ minim of a one per cent solution per kilogram of body weight. The length of time during which treatment is carried out depends on the individual case. The Wassermann reaction and the disappearance of symptoms and signs are the guide. The question of treatment affords a topic for lengthy discussion, which we shall not attempt here.

Recently we have used the soluble sulpharsphenamin subcutaneously, in concentrated solution. Selinger, who is in charge of the intravenous therapy in the clinic, has treated a

series of patients with sulpharsphenamin, using, as nearly as possible, similar cases in which neo-arsphenamin has been employed, and believes that the latter treatment is more certain and efficacious.

Ong and Selinger condemn the use of the longitudinal sinus in giving intravenous treatment to infants as dangerous and unnecessary. They use a vein in the arm, or the scalp, or the external jugular. They advise six doses, given once a week with mercury and followed by mercury alone for two months. In 350 treatments no fatalities followed the injection. In two cases kidney irritation occurred, and in one case stupor occurred after lumbar puncture, accompanying an intravenous injection. This case soon reacted. Cardiac distress occurred in two older children, and thyroid enlargement with tremor in another.

One of the infants in our clinic suffering from primary syphilitic nephritis was given guarded modified injection treatment with arsenicals, resulting in disappearance, rather than increase, of the kidney symptoms.

Nursing Measures in Syphilis of New-Born

Nursing measures involve the treatment of the persistent diarrhœa which is sometimes present. I have found that the use of a calcium-caseinate such as "Casec," given before nursing often is valuable. Usually one-third ounce is suspended and brought to a boil with six ounces of water, and an ounce given before nursing.

If the mother shows a negative Wassermann and the child a positive one, the child may nurse with reasonable safety, but if the child is negative and the mother positive, nursing should be stopped. The syphilitic mother's milk is safe for healthy

infants after boiling. Mothers who receive arsenic preparations should not nurse the infant at the breast for twenty-four hours afterward.

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CHAPTER X

CONGENITAL HEART DISEASE, AND THE COMMONER DEFORMITIES AND MALDEVELOPMENTS

By JOHN A. FOOTE

"CONGENITAL HEART DISEASE," says Holt, "is one of the causes, but not a frequent one, of death during the first days of life." Cyanosis is a symptom of this condition, but may not be present. A more frequent cause of cyanosis in the newborn is intracranial hemorrhage. The cyanosis in congenital heart disease is not due to admixture of arterial and venous blood, but to incomplete oxygenation in the wake of an impaired pulmonary circulation.

Defects in the development of the heart are of three types: (a) those due to failure of development of some part of the heart, as the ventricular septum or the pulmonary artery; (b) those due to the persistence of a fœtal appendage, as the ductus arteriosus (these lesions may be compensatory to failure of development in other parts of the heart); and (c) those due to fœtal endocarditis, such as pulmonary or aortic valvular disease. This type is relatively uncommon.

FREQUENCY OF VARIOUS LESIONS

Pulmonic stenosis and a *defect in the ventricular septum* are the two lesions which are most frequently found *associated.* A *ventricular septum defect* is the most frequently found single lesion. *Patent foramen ovale, a defect of the interauricular septum,* IS *very rare by itself,* appearing in only nine of Holt's 242 collected autopsy records. Associated with pulmonary stenosis it is found in about one-fourth of all cases.

Pulmonary stenosis by itself, or a defect of one or both septa, and sometimes with persistent ductus arteriosus, is the most frequently seen of all lesions. Abnormalities in the *origin of the large vessels,* with or without lesions in the heart itself, are fairly common. *Cardia dextra,* or transposition of the heart, is rather rare. It is well to remember that there is a tendency toward multiple deformities rather than single lesions in these congenital heart abnormalities.

Frequently Found Symptoms

The most frequently found symptom is an atypical murmur, especially when associated with cyanosis. This murmur is usually not loudest at the apex; most frequently it is at the base. *A murmur at the base, systolic in time, in a cyanotic infant practically always means a deformity of the heart,* usually pulmonary stenosis, with or without a septal defect.

A *continuous* murmur heard loudest at the *base* and *intensified in systole* is characteristic of a *persistent ductus arteriosus,* which is usually compensatory to and associated with pulmonary stenosis or a septal defect.

A *systolic murmur heard over the sternum,* but *without cyanosis,* has been studied by Holt. He found at autopsy, in these cases, a defective ventricular septum, but no pulmonary stenosis. This lesion frequently produced no functional pathology even in later life.

When a murmur is heard, loudly, over the base or over the sternum, and is emphasized also at the apex, in a cyanotic infant, it usually means a complex deformity of the heart.

Latent Lesions

Congenital heart lesions in the new-born may not exhibit symptoms until the heart suffers strain, as in coughing inci-

dent to a pharyngeal infection. Cyanosis alone is not sufficient for a diagnosis. If the cyanosis is persistent and a murmur is heard loudest at the base, or over the sternum, though audible over most of the precordium, the diagnosis may be reasonably well established, especially if a polycythemia is shown in the blood count.

Three Diagnostic Points

The association of these three points is pathognomonic of a congenital heart deformity.

1. Cyanosis, persistent and continuous.
2. A systolic murmur heard over the heart but loudest at the base or over the sternum.
3. A marked increase of the red cells over 5,000,000.

Diastolic murmurs are rare, and are due to pulmonary insufficiency.

Prognosis

The prognosis, especially in the cyanotic infant, is not good. Death usually occurs within the first five years of life. Extreme cases die within the first two months, frequently of some simple intercurrent condition which puts an extra burden on the heart. In infants with murmurs unaccompanied by cyanosis the prognosis is much more hopeful.

Treatment

The treatment is purely symptomatic. In the severe paroxysms of cyanosis brought about by coughing, stimulation of the skin by application of cold water is sometimes useful, supplemented by artificial respiration, and injections of solution of adrenalin chloride 1 to 1000, minims 3.

Angina-like attacks when present are sometimes relieved by nitroglycerin—1/1000 to 1/500 grain, given by hypo-

dermic injection. The child should be fed with a spoon or Breck feeder when the cyanosis is extreme, as the exertion of nursing may cause further heart strain. Mother's milk should always be used, and distension of the abdomen should be relieved by daily enemata.

Hare Lip, Cleft Palate, Hygroma Colli, and Constitutional Diseases

Developmental clefts in the soft parts of the face always require surgical treatment. Hare lip, the most common defect, varies from a slight furrowing to a complete fissure up to the nostril. It is usually associated with clefts of the palate.

Cleft Palate

Cleft palate may be either unilateral or bilateral. Palatal clefts may be either single or double; they may involve the maxilla and the hard and soft palate, or may simply divide the soft palate and the uvula. Palatal defects are sometimes present without hare lip. (Figs. 32 and 33.)

The new-born infant should therefore be inspected for mouth abnormalities in the routine examination. The nutrition of infants with hare lip and cleft palate should be good before operative treatment is attempted. Only when cleft palate threatens the life of the new-born should this severe operation be attempted within the first few weeks of life. American surgeons usually do not operate on clefts of the bony palate in children less than six to nine months old.

Nutrition in Cleft Palate Infants

Frequently these children are poorly nourished, and are under weight for their age. I personally studied the nutrition statistics in these patients in a number of hospitals, and

found that degrees of poor nutrition of from 30 to 40 per cent prevailed in patients operated on for cleft palate. In some hospitals pre-operative weights were not even recorded,

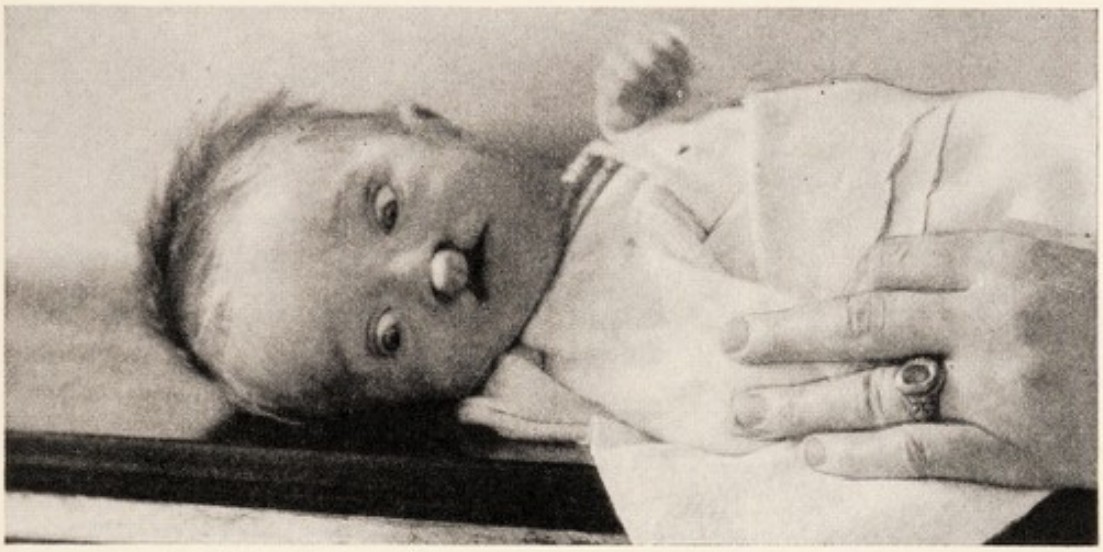


FIG. 32.—Cleft palate, with pronounced intermaxillary snout and hare lip.

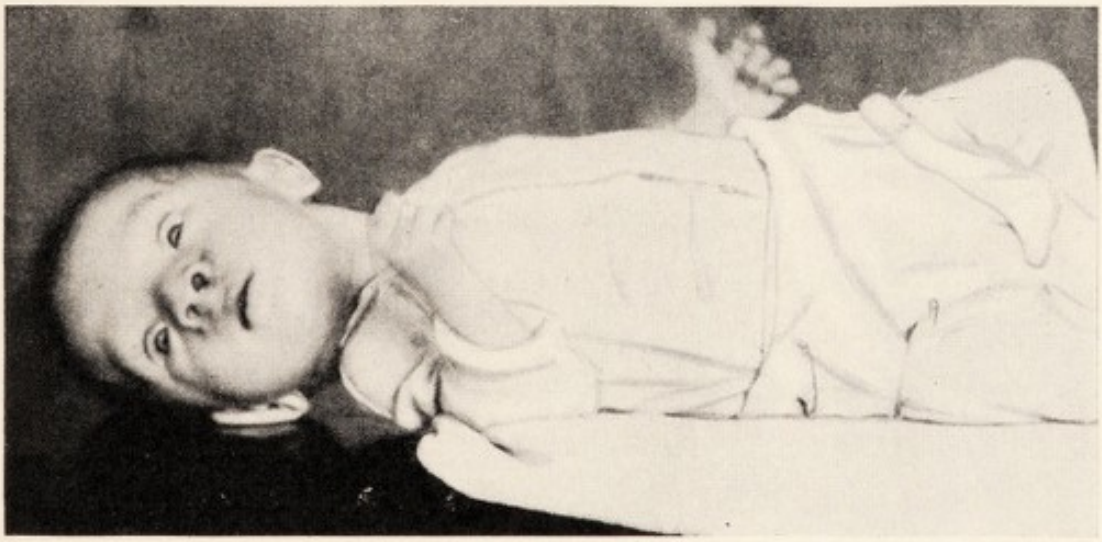


FIG. 33.—The same child ten days after operation. Children's Hospital, Washington, D. C.

despite the fact that the nutrition of these infants is of the very greatest importance. Usually the infant with a palatal cleft cannot nurse the mother, and the milk secretion is allowed to dry up. The following routine should be followed:

1. The milk should be expressed from the mother's breast and supplemented if necessary.
2. The infant should be fed with a Breck feeder, using a nipple with a hole in its side placed against the tongue.

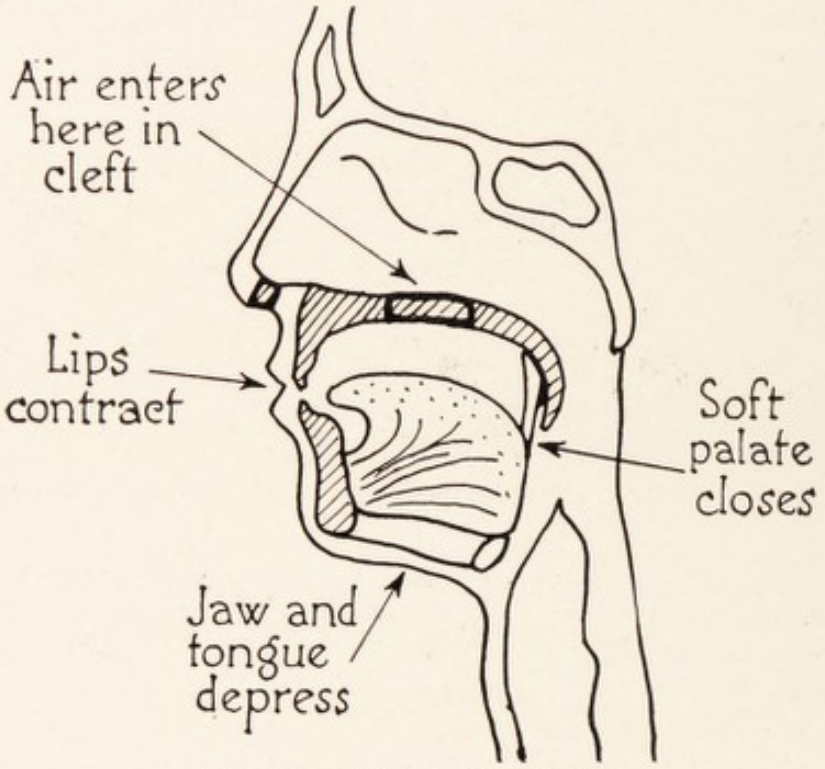


FIG. 34.—Sucking and cleft palate.

3. The infant should be in a semi-erect position when fed, to prevent fluid from running by gravitation into the cleft.
4. The simple obturator described below should always be used to prevent fatigue on the part of the infant and to enable him to suck productively.

Working in conjunction with Dr. Clyde Gearhart, a dental surgeon, we succeeded in producing a simple external obturator to enable such infants to form a mouth vacuum and nurse from the bottle, and sometimes from the breast. No amount of spoon feeding will be so effectual as a method

which enables the infant to use its own sucking reflex. It may be that digestive or peristaltic action is stimulated, but in any event the use of the obturator nearly always causes increased intake of food and a rapid gain in the nutrition of the cleft palate infant. (Fig. 35.)

The obturator consists simply of a strip of light dental rubber dam, one to two inches wide and three inches long, laid

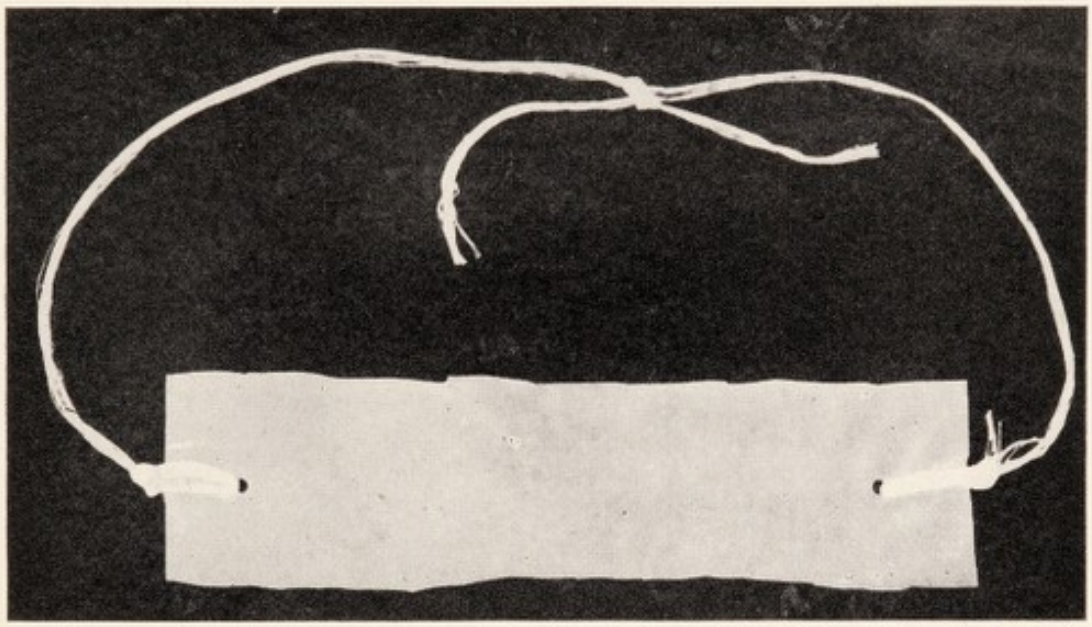


FIG. 35.—A simple obturator for the use of cleft palate infants, consisting of a strip of rubber dam with tapes.

over the nose and lip, and fastened by tapes to the head, tied near the occiput. (Fig. 36.) As the infant tries to suck, any air passing through the cleft to the nose draws the rubber tissue against the nostrils and seals them more firmly, and in this way prevents air from entering the mouth through the palatal cleft. Every two seconds the upper edge of the rubber strip should be slightly lifted away from the nose in order to enable the child to receive air. Usually the child more than a month old learns after a little while to open his mouth to breathe while nursing with this appliance on. (Fig. 37.) Sometimes, when the infant sucks weakly, it is necessary at first to press

the rubber against the nostrils with the fingers in order to effectually seal them.

FIG. 36.—The child sucks successfully with the obturator in place.

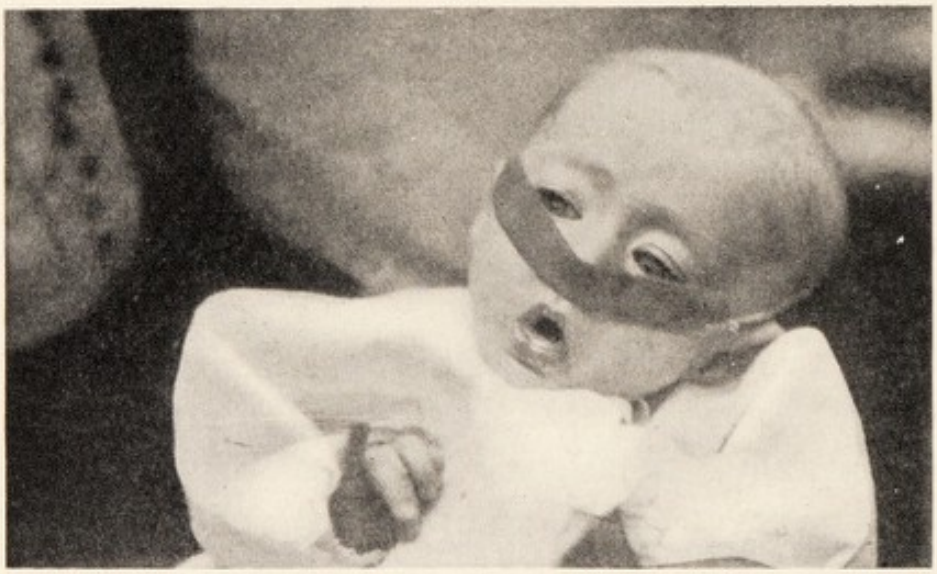
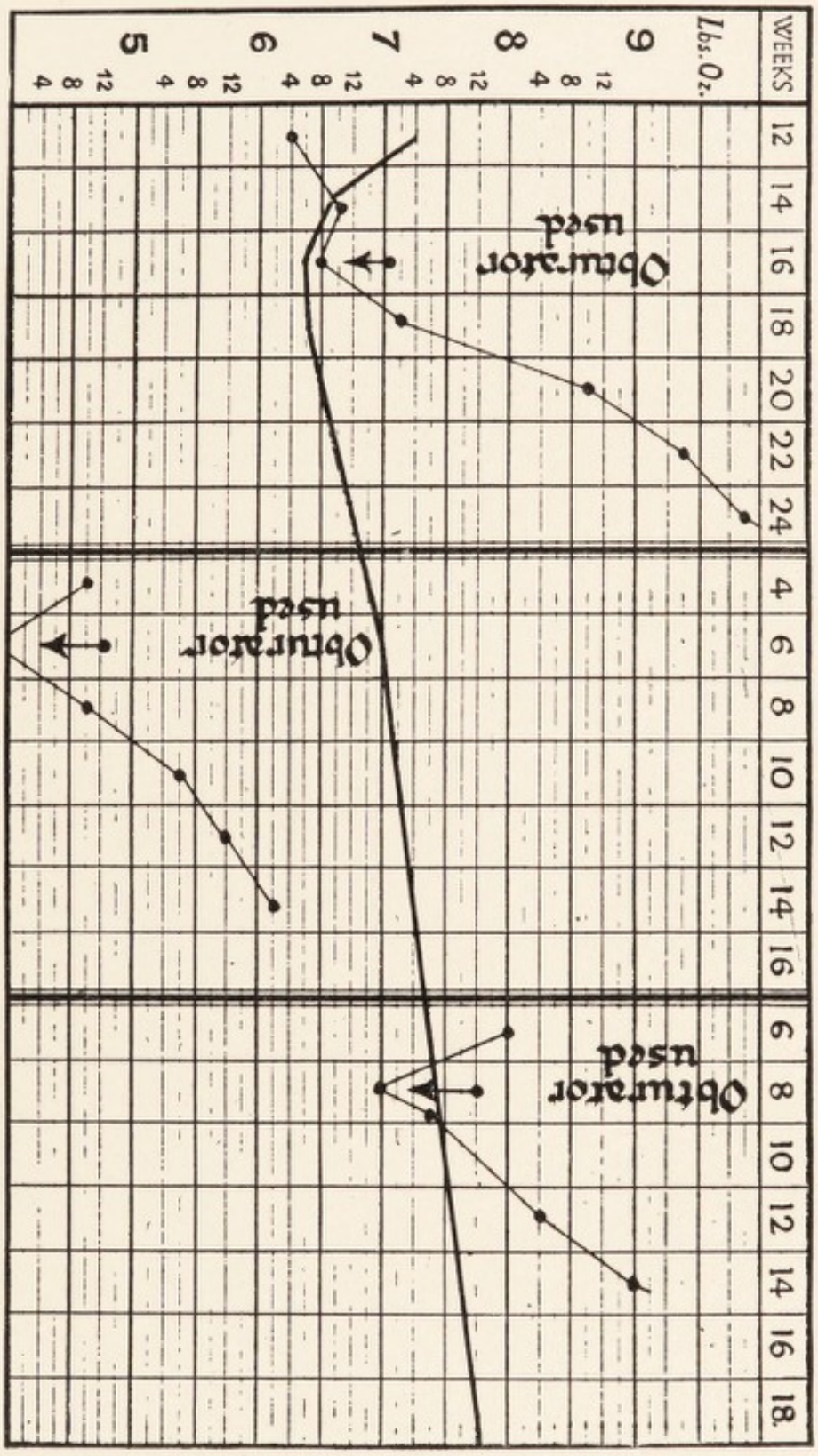


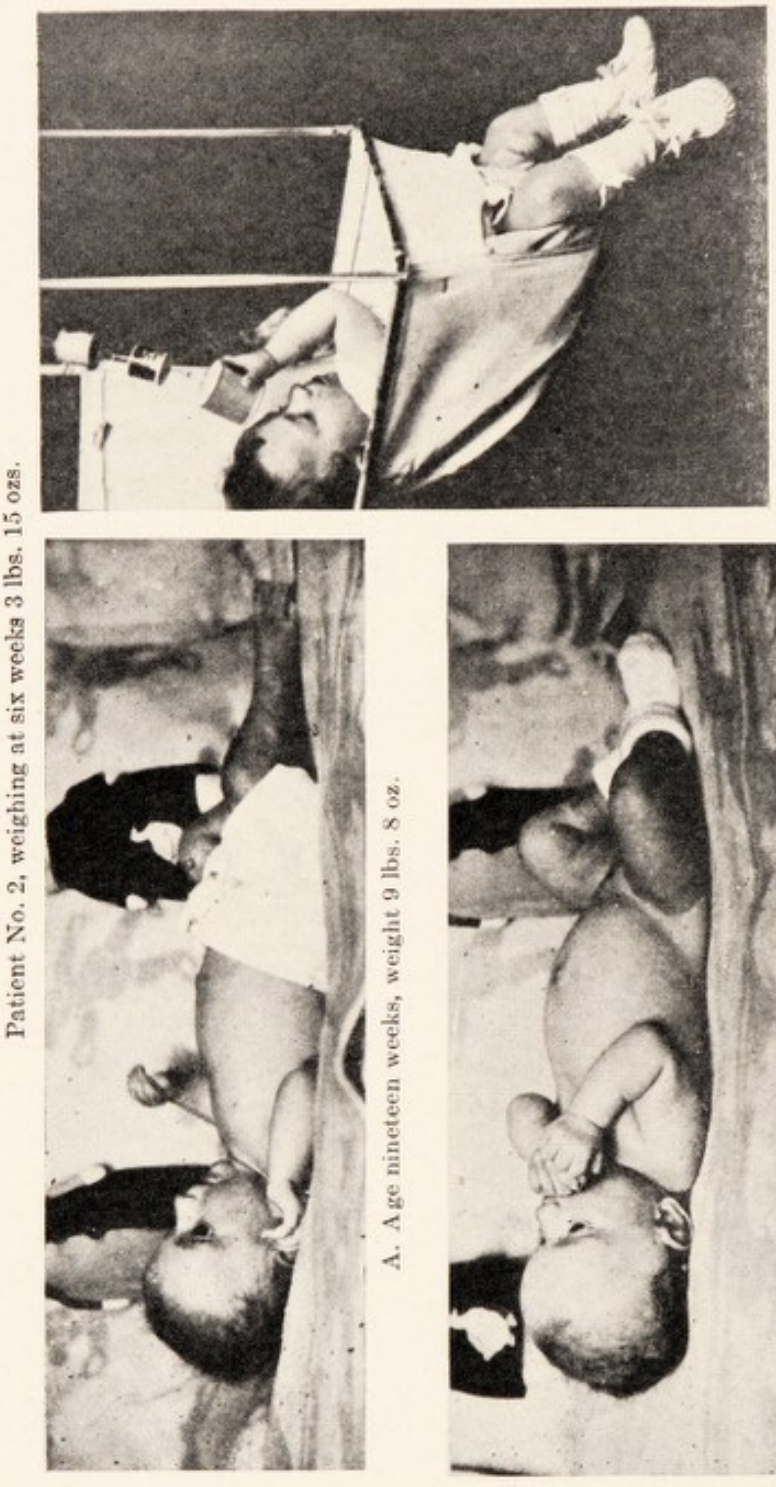
FIG. 37.—The obturator in place, the child breathes through his mouth.

Where mothers have long nipples the obturator may be used also for breast feeding, although good results are seldom obtainable by breast feeding, since the breast-fed infant



(1) Baby S. (2) Baby M. (3) Baby J.

FIG. 38.—Weight charts of cleft palate cases showing results of increased intake.



Patient No. 2, weighing at six weeks 3 lbs. 15 ozs.

A. Age nineteen weeks, weight 9 lbs. 8 oz.

B. Same as "A."

C. Age twelve months, weight after operation 16 lbs.

FIG. 39.—Result of use and discontinuance of the use of the obturator in cleft palate. Using the obturator the infant gained 89 ounces in thirteen weeks as contrasted with its gain of only 104 ounces in thirty-two weeks after its use was discontinued.

expends at least eleven times as much energy in sucking as the bottle-fed infant.

The use of the Abt Milking Machine for mothers, which is now found in the larger lying-in institutions, is frequently efficacious in drawing out inverted or flat nipples, and stimulating milk flow.

Other clefts beside that of the palate are seen in the superior maxilla but are infrequent in occurrence.

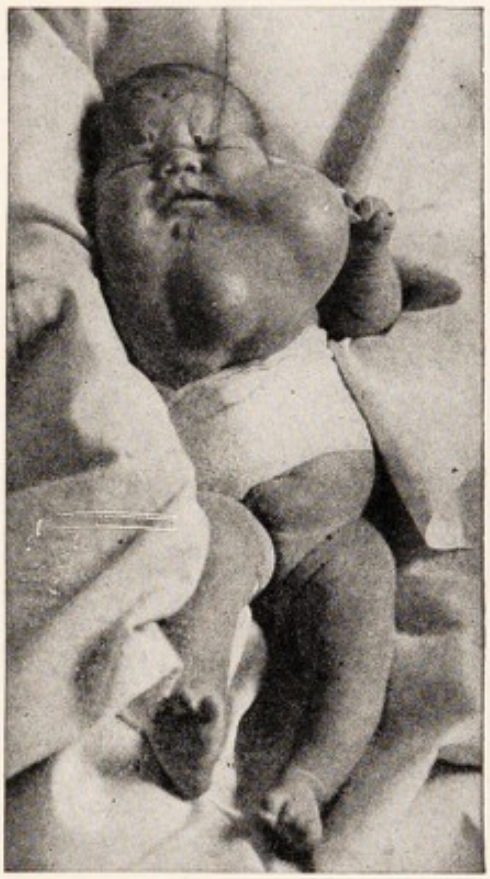


Fig. 40.—Lymphangioma colli cysticum. Newly-born infant. (Feer's "The Diagnosis of Children's Diseases.")

Branchial Fistulæ

Fistulæ due to persistence of branchial clefts are often present at birth. These fistulæ open on the lateral aspect of the neck and secrete a mucous fluid. Their internal opening lies near the tonsillar fossa or in the pharyngeal wall. They may be complete or incomplete, and may in the latter case be cystic in type. The treatment is surgical, and should not be attempted on the new-born infant.

Hygroma Colli or Lymphangioma Colli

Congenital cyst of the neck, or hygroma colli, is a congenital polycystic lymphatic tumor, which appears as a swelling in the neck near the great vessels, grows rapidly, and may even pass beneath the clavicle and cause pressure on the trachea or œsophagus. Death from asphyxia has been caused by this growth. (Fig. 40.)

Radical removal is indicated, but recurrence after operation is frequently seen.

Cysts of the salivary glands, ranula, are congenital, and if large require surgical treatment.

Thyroid Disease in the New-Born

Congenital goitre is described by Deme, by Hesselberg, by Wolfler and others, but is not common. A case seen at the Washington Children's Hospital required tracheotomy to relieve obstruction while undergoing surgical extirpation. According to Wolfler, tracheotomy in the new-born is practically always followed by pneumonia and death. The mother of this infant had received iodide of potassium in "mixed treatment," while pregnant. Iodide medication in the mother is believed to favor the production of this condition. (Fig. 41.)

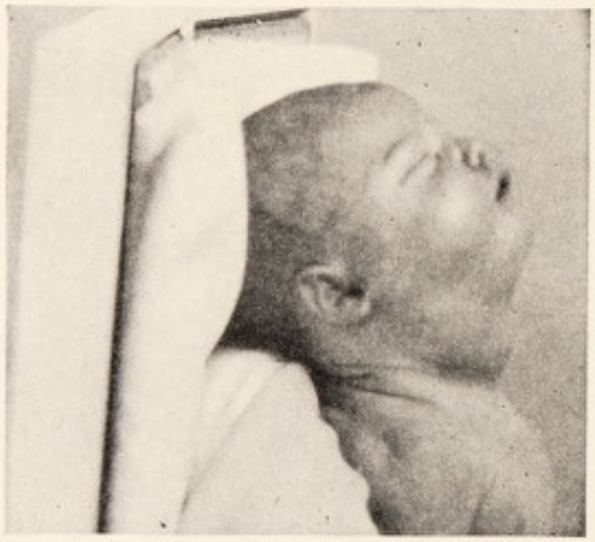


Fig. 41.—Congenital goitre in a child seventy-two hours old. Children's Hospital, Washington, D. C. (Dr. Edmund Horgan.)

Transitory enlargement of the thyroid is sometimes seen soon after birth. *Absence of the thyroid,* or insufficient thyroid function caused by hypoplasia or aplasia of the gland results in *cretinism.* (Fig. 42.) Stigmata of this condition are rarely present at the time of birth, but Talbot has made some interesting observations on metabolic evidence of its early development.

Typical *myxœdematous new-born* children have been described, but are rare. The metabolic results of lack of thy-

roid secretion come on gradually, and are usually not noticed until after the first year. Hypophyseal hypoplasia, or Frölich's syndrome, is usually not manifest at birth. It is characterized by a pasty, fat habitus with small genitalia.

Mongolism

Mongolism, or mongolian idiocy, is frequently associated with thyroid hypoplasia. This condition is obvious from the

Fig. 42.—Athyrosis. Age, five and one-half years as compared with a normal girl of five years. Height 72 cm. (28½ ins.), 31 cm. (12¼ ins.) below normal. (Feer's "The Diagnosis of Children's Diseases.")

moment of birth. The slit-like slanting eyes, broad nose, large protruding tongue, loose joints, trident hand, hypotonic musculature—all are present at first. Mental hebetude and often loud, harsh breathing are symptoms usually noticed before many weeks have passed. The accompanying photograph shows a typical mongolian idiot at three weeks of age. (Fig. 43.)

Thyroid gland extract as well as anterior pituitary extracts have been used in treatment of mongolism. Thyroxin in doses of .00008 gm. may be used twice daily, if the basal metabolism is low.

The outlook for development of the mongoloid idiot is

FIG. 43.—Mongolian idiot, three weeks old. Note almond eyes and protruding tongue. Children's Hospital, Washington, D. C.

unsatisfactory. More depends on his care and training than on medication.

CONGENITAL ABNORMALITIES OF THE BONES

The condition at birth of craniotabes and congenital softness observed in other bones, is called *congenital rickets,* by Kassowitz, Feer, Marfan and other authors. Although this etiological designation is disputed, the congenital condition does resemble rickets, clinically, and is helped by heliotherapy, cod-liver oil and phosphorus. *Osteogenesis imperfecta* should be excluded in the differential diagnosis.

ACHONDROPLASIA (CHONDRODYSTROPHY)

Chondrodystrophy, or *micromelia,* also known as *osteosclerosis congenita* and *achondroplasia,* is a congenital disease of the bone in which growth at the epiphyses is retarded while

the periosteum continues to grow and the cartilages, especially of the long bones, ossify very incompletely or to a very slight degree, because of the general osseous dystrophy. This produces a characteristic appearance of very short and almost rudimentary arms and legs, with the skin thickened and thrown up into transverse folds and furrows. The head is large proportionate to the body, and the anterior fontanelle is very large. The tongue protrudes and the "sneezing facies" is a peculiarity of this condition. Abels believes this condition to be a disease due to disturbance in internal secretion equilibrium, resulting in a congenital hyperthyroidism.

Many such "micromeliacs" are born dead or die shortly after birth. Survivors become the chondrodystrophic dwarfs, and are normal mentally and sexually. Abels gives as a prognostic point the relation between the body length and the head circumference. In the normal new-born the circumference of the head in centimetres is to the length of the body almost as 2 is to 3, or the head circumference is about 67/100 of the body length. Few survive whose ratios are higher than 80/100—extreme cases show a ratio of 120/100. Some degree of hydrocephalus is present in most dwarfs of this type.

The *diagnosis* rests on the extreme shortness of the limbs proportionate to the body length, and on the quotients given above, as well as on reöntgenological studies.

Fragilitas Ossium

Osteogenesis imperfecta or *fragilitas ossium,* or *osteopsathyrosis,* in the new-born is a condition in which the infant is born with multiple fractures, due to the disturbed periosteal and endosteal calcification. Because the callus forms rapidly, giving rise to annular swellings, this disease was once known as annular fœtal rickets. The membranous bone of the skull

is very thin, and the long bones usually show numerous fractures. Most children with this disease are born dead or die shortly after birth. The X-ray readily confirms the diagnosis. The calcium balance in blood examinations is also shown to be a minus quantity. Some observers report improvement in older children when cod-liver oil and phosphorus were given.

Congenital Amyotonia

Amyotonia Congenita of Griffith, or the myatonia of Oppenheim—Oppenheim's disease—is a neuromuscular dis-

Fig. 44.—Amyotonia congenita. Age, three months. (Feer's "The Diagnosis of Children's Diseases.")

ease of obscure etiology, ascribed variously to a spinal muscular atrophy, or to fœtal poliomyelitis. The child is usually large, pale and flabby, moves his extremities not at all, or very little, and frequently the trunk muscles are also affected. The findings even at birth resemble those seen in so-called infantile paralysis. Knee jerks and other reflexes are absent, and electrical reactions are diminished or abolished. These children may improve slightly and gradually if they live, but most of them, if the paralysis is extensive, die of an

intercurrent lung infection. There is no rational treatment excepting good general hygienic measures. (Fig. 44.)

Congenital Hydrocephalus and Spina Bifida

Congenital hydrocephalus, which is often associated with spina bifida, or other deformities, is of two clinical types; (a) that arising from distension of the ventricles with fluid, *internal hydrocephalus,* (b) that arising from effusion on the brain surface, *external hydrocephalus.* The latter is rarely found in the new-born. (Fig. 45.)

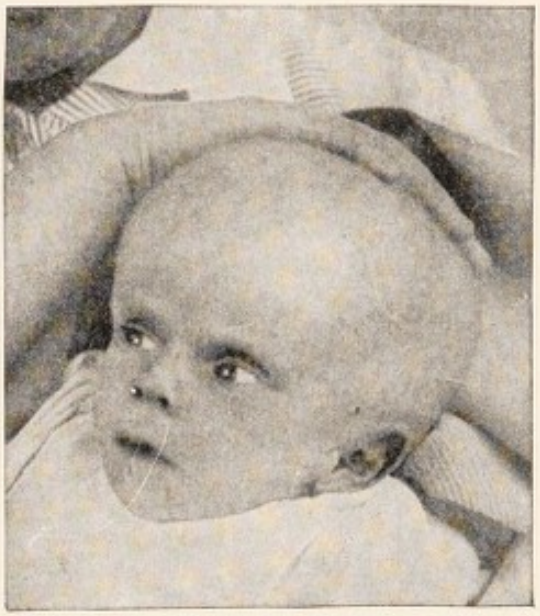


Fig. 45.—Hydrocephalus following cerebrospinal meningitis. Age, five months. Weight, 3,500 gms. (7¾ pounds), head 46 cms. (18 ins.) (Feer's "The Diagnosis of Children's Diseases.")

The baby with this condition nearly always has an unusually large head, which may cause trouble in delivery. The head rapidly increases in size in the few weeks after birth, the sutures separate, the fontanelles bulge. Measurement of the head reveals an abnormal increase in size when compared with the head-chest measurements of normal children of the same age. Death occurs from pressure. Rarely a hydrocephalus is found without enlargement of the skull—*microhydrocephalus,* but usually the head diameter exceeds 50 cm. Lumbar puncture or cisterna puncture may give relief pending operation. Although operative treatment is usually quite unsatisfactory, *no* treatment frequently results in death or idiocy.

Spina Bifida and Allied Conditions

Anencephaly, or absence of the cerebrum, is a rare deformity. Failure of some parts of the bony sheathing to close, and

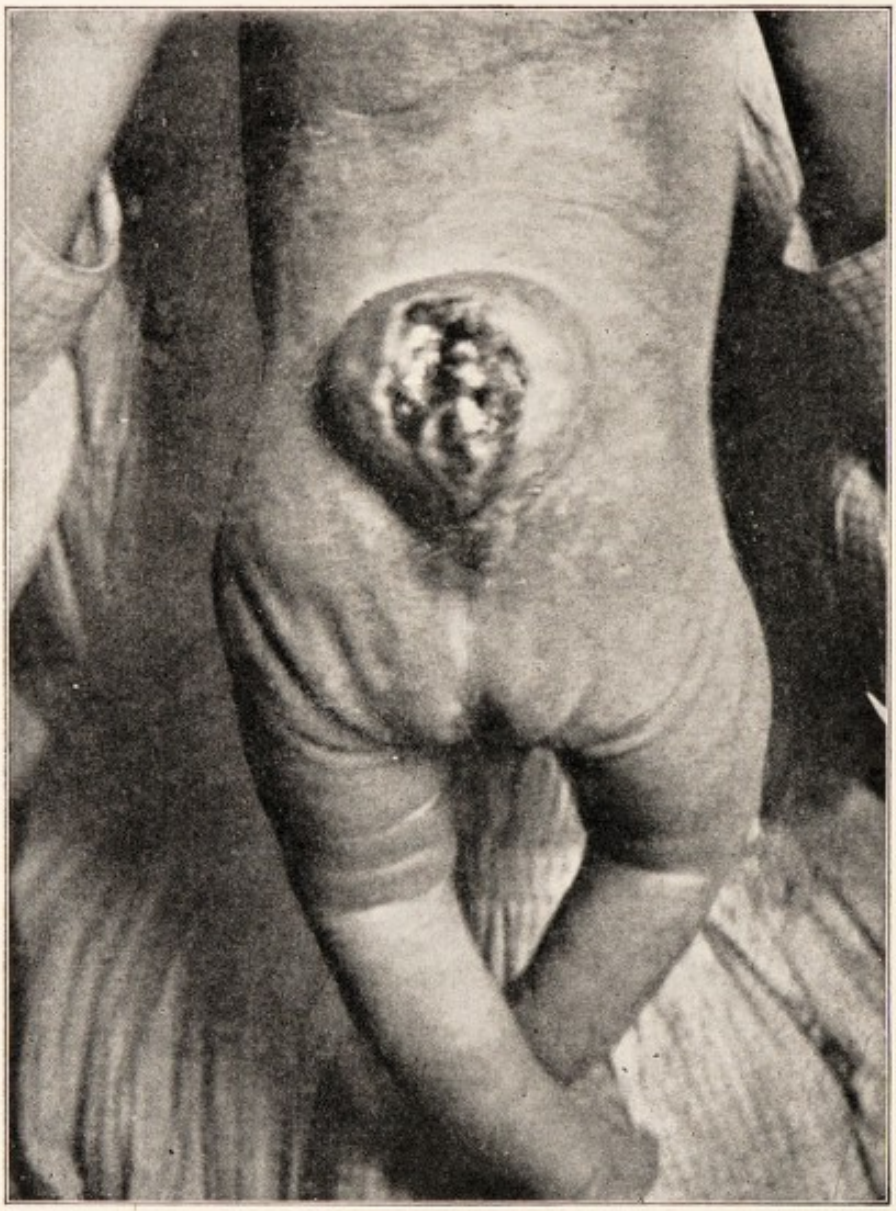


Fig. 46.—New-born child with rachischisis. Complete pelvic paralysis. Death on twelfth day, no operation. (Pfaundler and Schlossman.)

the protrusion of the brain, its membranes or the spinal cord, are a class of deformities not uncommonly seen in the newborn. When the membranes of the brain or cord protrude the condition is called *meningocele*. *Encephalocele* means a

protrusion of the brain with its meninges. When the tumor contains fluid, as when a portion of a ventricle protrudes, the enlargement is called *encephalo-cystocele.*

Spina bifida is the general term used to include protrusion of the spinal cord and its coverings through a developmental hiatus in the spinal column. (Fig. 46.)

Encephalocele

Encephalocele may be *basilar* or *frontal.* In the basilar encephalocele the hernia of the brain projects into the nasal or the pharyngeal cavity, frequently through the cribriform plate of the ethmoid, in which case nasal obstruction results, or sometimes between the sphenoid and ethmoid bones, or even through a cleft in the soft palate, appearing in the roof of the mouth.

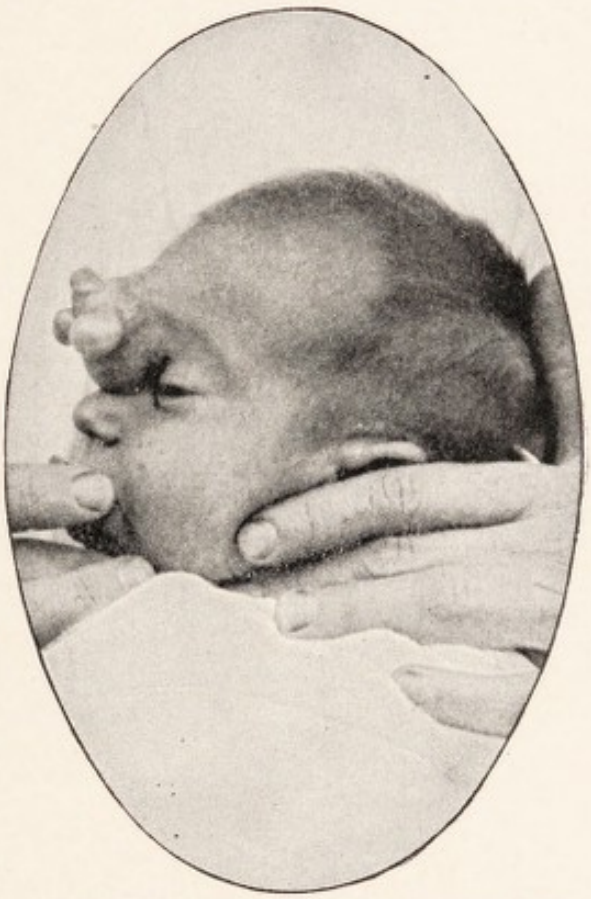


Fig. 47.—Anterior nasofrontal encephalocystocele. Child eight weeks old. The cystic enlargement communicates with the interior of the skull (*tumeur erectile*). (Pfaundler and Schlossman.)

Spheno-orbital, or spheno-maxillary types are also found, appearing in the corresponding orbital fissures.

Frontal encephalocele is most frequently of the naso-frontal variety, the protrusion showing between the nasal process and the frontal bone. Several other varieties are found corresponding to the articulations of the frontal bone with the ethmoid and other facial bones. (Fig. 47.)

Occipital encephalocele is found either just above or just below the occiput, occupying the posterior curve of the neck. It is the most frequently found variety of encephalocele. (Fig. 48.)

FIG. 48.—Superior occipital encephalocystocele. Child one week old. The protrusion contained the cystically distended cerebellum. (Pfaundler and Schlossman.)

Encephaloceles are usually round or oval in form, with a shiny, rather bluish skin covering. They vary in size from a hazel nut to a cocoanut, and may have either a broad base or a very narrow pedicle. Screaming or coughing may cause fluctuation in the tumor mass, and their size may vary with change of position. Pressure on the tumor may cause symp-

toms of intracranial pressure. These tumors may remain stationary in size, or may increase rapidly. The prognosis, always grave, varies according to the size and static condition of the mass. Frequently these hernias burst, or may become infected and result in paralysis or idiocy.

The treatment is surgical, and consists of the radical extirpation of the tumor, even though it contains brain substance. Small tumors, those with a pedicle, and especially those in the occipital region, offer the best operative prognosis. In the smaller tumors operation should not be undertaken too early. Large and rapidly enlarging tumors demand early operation. Hydrocephalus sometimes follows successful removal of the tumor.

Spina Bifida

Spina bifida is an embryonic defect in closure of the spinal canal at a particular spot—usually the dorsolumbar or lumbosacral region, and, rarely, the cervical region of the spine. In the open form the child is not viable. The closed form, or cystic spina bifida, consists of a cystic mass protruding through a cleft in the posterior aspect of the vertebral column, with or without a cleft in the overlying skin.

The tumor of spina bifida resembles that of the cerebral protrusions. It is nearly always distended with cerebrospinal fluid.

Myelocele, or meningo-myelocele, is the name given to the tumor when the spinal cord itself is concerned in the embryonic fissure. In this form the cord lies open from the central canal outward and is seen on the summit of the tumor, which is dark red, fungiform, and fluctuant. There are three zones in this mass; the first is a layer resembling granulation tissue, dark red in color, and known as *the medullary-vascular*

zone; it represents the spinal cord, and the spinal nerves pass out of it. The next layer is a thin, grayish membrane, called *the epithelio-serous zone,* which corresponds to the pia mater. *The dermal zone,* outside of this, is made of normal skin, and covers the tumor to a varying extent from the base upward.

Fig. 49.—Cystic spina bifida. This eight-year-old boy has no control of urination or defecation. Children's Hospital, Washington, D. C.

When the membranes of the cord alone are found in the tumor it is called a *meningocele.* This is a rare form. When both the spinal cord and membranes are found in the cleft it is called a meningomyelocele — the central canal of the cord having widened at the point of the fissure to form part of the cyst wall. When the skin has closed over the membranes, leaving a projection through a hiatus in the vertebræ which is soft and fluctuating the latter is called a cystic *spina bifida* (Fig. 49.)

Spina bifida occulta, or the cleft with no tumor mass, may show no visible signs but may cause reflex and other disturbances. Many of the abnormal lines seen on the skin in the region of the anus in children are the remains of embryonic spinal clefts, but are of no pathological significance.

The prognosis and course of spina bifida is more favorable in the small varieties with the minimum of spinal tissue involved. Sometimes the smaller tumors disappear spontaneously if the skin covering is complete. Infection is common in the larger tumors, and paralysis and convulsions, incontinence of urine and fæces, are commonly seen in the myelocele and meningo-myelocele types, with pyelitis and sepsis as terminal conditions.

Cutler found a mortality of 29.8 per cent in 104 cases admitted with spina bifida or cephalocele. The operative mortality of 65 cases operated on was 47.6 per cent. Among the four cranial meningoceles he operated on, two are well, one died, and one is developing hydrocephalus rapidly. Early operation, says Cutler, may prevent deaths from infection or leakage of cerebrospinal fluid, but the frequent incidence of hydrocephalus and death after the removal of the sac is cause for a guarded prognosis. The contra-indications to operating are: hydrocephalus, extensive paralysis and infected sacs. Small cephaloceles with thin membranes should be operated on to prevent infection and leakage. There is always danger of post-operative hydrocephalus.

The treatment is frequently unavailing. Strict cleanliness is important in the care of all types of the deformity. Operation on the larger varieties must usually be done early to avoid infection, but the outlook is usually not promising at best.

Meningitis and Encephalitis

When ascending infection from any cause localizes in the brain it produces meningitis or encephalitis.

Symptoms.—Meningitis of the new-born may not be accompanied by the characteristic high fever often observed in older children, but bulging of the fontanelle and retraction of the head are usually present. It occurs rarely, independently of lesions such as hernia cerebri—the so-called idiopathic type. This is also true of suppurative encephalitis. Both of these conditions are sometimes manifestations of the so-called sepsis of the new-born. Lumbar puncture will confirm the diagnosis by the presence of purulent fluid. The prognosis is grave. Treatment is symptomatic.

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CHAPTER XI

DEVELOPMENTAL ANOMALIES OF THE URO-GENITAL AND DIGESTIVE ORGANS; AND HERNIAS

By JOHN A. FOOTE

RETENTION of the testis in the inguinal canal is not uncommon in the new-born, and need not be considered pathological.

Epispadias is the term used to describe an abnormal position of the urethral orifice when it appears on the upper surface of the glans penis or bladder region; *hypospadias* describes an abnormal position of the orifice of the urethra on the inferior aspect of the glans penis or the scrotum. The treatment of these conditions is surgical. Few surgeons care to operate before the child is at least three years old or older, excepting when slight palliative procedures may be indicated.

The persistence of the allantois as an open tube in the umbilical ring causes a leakage of urine through the umbilicus —a *urachal fistula.* Malformations of the allantois, or the urachus, or obstruction to the urinary outflow from the bladder favor the production of this condition. The injection of solution of methylene blue intravesically with a fine syringe, or through a small catheter if the urethra is pervious, will clear the diagnosis, provided the blue fluid reappears at the umbilical site. If an obstruction exists it usually demands surgical relief, but plastic operations are seldom undertaken early. If no obstruction exists and the canal lumen is narrow, cauterization with silver nitrate may be effectual in closing it.

Urachal cysts may form in the lower third of the tube, if the urachus is obstructed in certain parts of its course and patent elsewhere.

Ectopia vesicæ, or exstrophy of the bladder, is a malformation of serious import. Through an arrest in development, a median abdominal cleft is formed extending from the pubic symphysis upward toward, and sometimes up to, the umbilicus. A red or pink tumor mass extrudes through this opening above the pubic symphysis, and the urethral orifices may be distinguished in the mucous membrane on the posterior wall of this mass. (Fig. 50.) The urethra is also involved in most instances. In addition, it is common to find abnormalities of the external genitalia — rudimentary penis, epispadias, divided scrotum, undescended testicles, etc., in boys, and corresponding abnormalities in girls.

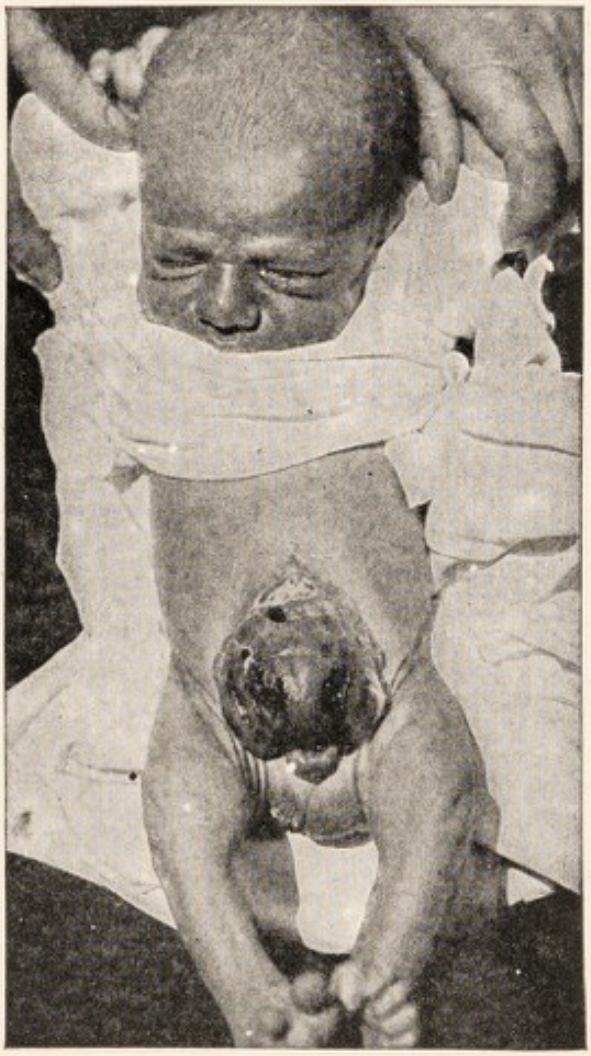


Fig. 50.—Exstrophy of the bladder. Age, three weeks. (Feer's "The Diagnosis of Children's Diseases.")

Early operative *treatment of this condition* is dangerous, and no treatment, operative or otherwise, is quite satisfactory. Operation should always be postponed till past the time of infancy. Scrupulous care should be taken to prevent ascending infection. Some surgeons recommend the use of compres-

sion apparatus of various types for the purpose of reducing the bladder hernia, pending operative interference.

Umbilical Hernia

By congenital umbilical hernia of the new-born is meant not the slight protrusion of the navel seen after the first

Fig. 51.—Umbilical hernia. Child four months old. Mushroom-shaped umbilical hernia. Umbilical ring over 1 cm. in diameter. Operative closure. Contents, omentum. (Pfaundler and Schlossman.)

month or two in some children, but the larger protrusions seen at birth. These consist of:

1. Absence of the anterior abdominal wall with extrusion of viscera, and absence of umbilical ring, and sometimes of the rectus muscle.
2. Protrusion of a hernia through a weak and dilated umbilical ring, with diastasis of the rectus muscles.

These umbilical tumors are usually round or oval, with a transparent sheath, through which may be seen blood-vessels, viscera, etc. Sometimes this sheath bursts after or during delivery, with extrusion of coils of intestines. Peritonitis is almost certain to follow rupture of the sheath. Immediate operation is always indicated in these cases. Numerous tables of statistics show that the mortality from conservative

treatment is about 60 per cent, while from radical operation it falls below 30 per cent. The sooner after birth operation is performed the lower the mortality seems to be, probably because the danger of peritonitis increases with delay.

Congenital hernias of the diaphragm occur more frequently on the left than on the right side, but are rare. Total absence of the diaphragm may cause death from asphyxia in the new-born. Small diaphragmatic hernias frequently cause no symptoms whatever.

Lateral abdominal hernias are sometimes found in the new-born, and are usually in the region bounded by the anterior and posterior axillary lines. They are treated by bandaging.

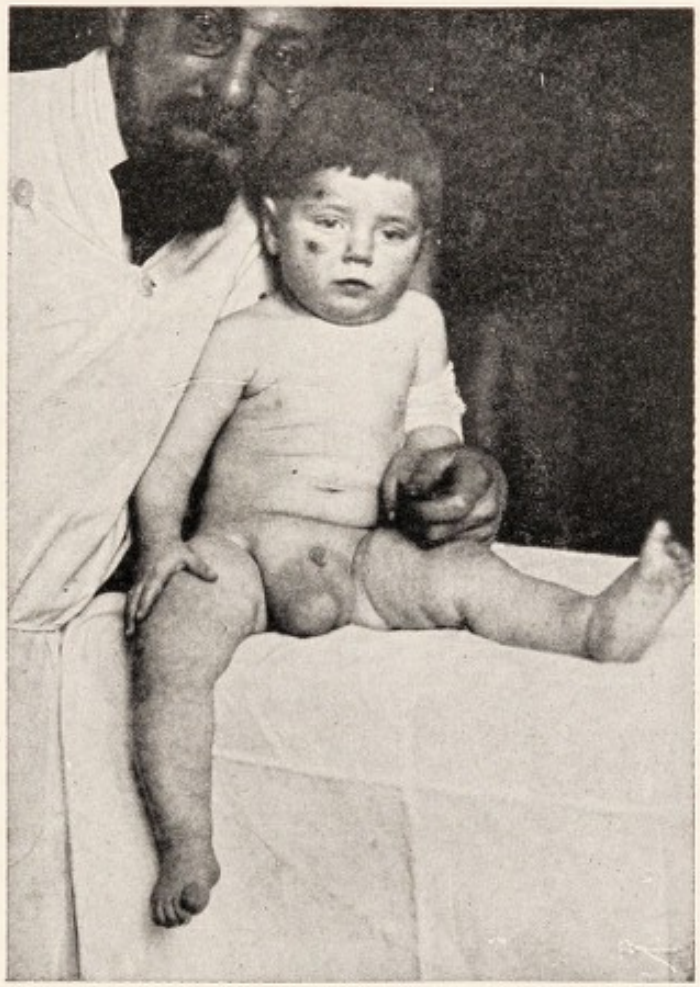


FIG. 52.—Complete bilateral inguinal hernia. Child fifteen months old. Hernia is congenital, and gradually grew larger. Inguinal rings round, admitting index finger. Herniæ have the size of a man's fist. Contents, intestinal loop; appendix palpable in the right scrotal sac; contents reducible. Penis completely drawn into the surface of the skin by the traction of the scrotal integument. Bilateral operation after Kocher. Right testicle difficult to detach from the hernial sac. The top of the hernial sac is left adherent to the testicle. (Pfaundler and Schlossman.)

Acquired umbilical hernia is strictly not a disease of the new-born. It is best treated by replacement of the hernia, and inversion of the skin over the hernia by means of a strap of adhesive plaster. (Fig. 51.) Usually several months'

treatment is required. If much rectus diastasis is present operative treatment may be necessary. (See page 188 for details of technique.)

Inguinal hernias are frequently found in the new-born, but femoral hernia is quite rare. The diagnosis is easy, and is

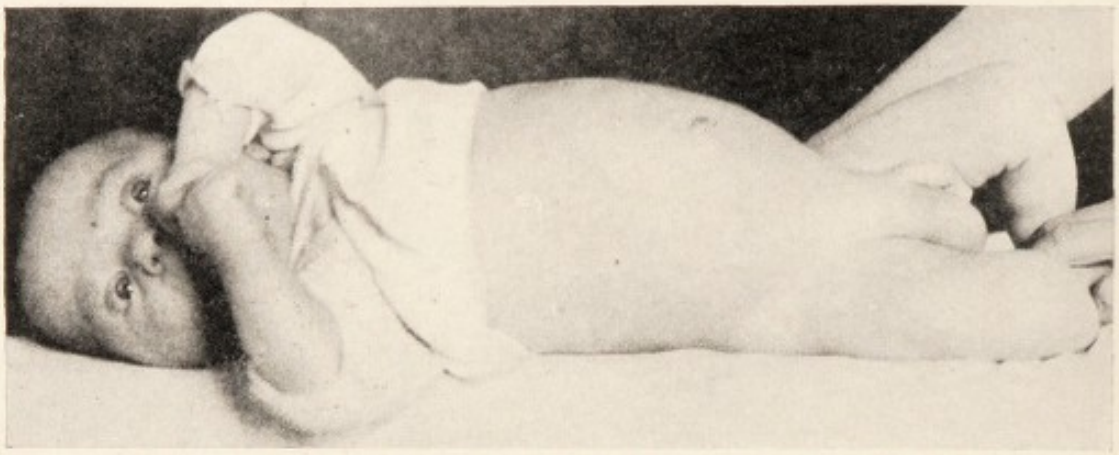


FIG. 53.—Right inguinal hernia. Six months old. Children's Hospital, Washington, D. C.

made by observation and palpation of the open inguinal canal. (Figs. 52 and 53.)

Operative treatment is frequently not necessary, nor should hard trusses be used. Use of the yarn truss suggested by Fiedler frequently results in a symptomatic cure. Bandaging should always be tried before surgery is resorted to. (See page 190 for technique.)

Hydrocele frequently results in the new-born from incomplete closure of the process vaginalis. It may not develop symptoms till later, although typical hydrocele is seen at birth. An enlarged scrotum, transmitting light through its substance is characteristic of hydrocele. It requires no treatment at first. Hematocele is not unknown, and is sometimes due to birth trauma. We have seen one case of gangrene of the testis from torsion of the cord during birth. The child was in great pain and cried continuously. Local signs confirmed the diagnosis of testicular injury.

Strictures and Occlusions

Congenital stricture of the œsophagus is sometimes seen, and stricture of the pylorus or duodenum is also not

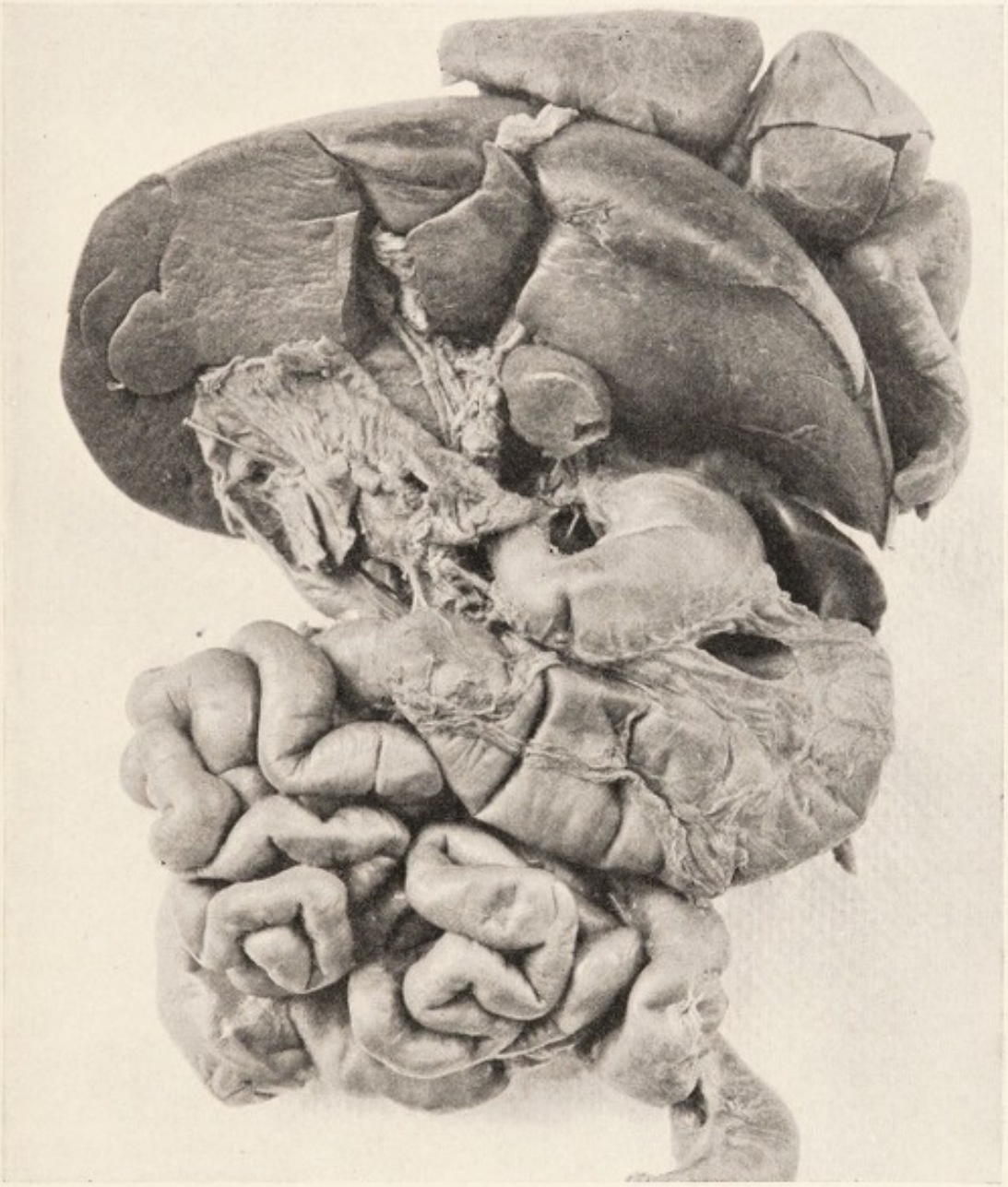


Fig. 54.—Congenital occlusion of bile ducts. Pin is inserted in accessory pancreatic duct. Common bile duct is absent. (Pathological specimen.—Hamilton and Foote.)

unknown. These conditions are fatal. Symptoms do not appear until the child attempts to swallow food or water.

Drooling of secretions and vomiting then appear promptly, and in the œsophageal stricture paroxysmal coughing follows each attempt to swallow. This is particularly the case when, as frequently happens, a fistula exists between the trachea and œsophagus. Cleft palate, even when incomplete, presents similar symptoms, and may be overlooked if hare lip is not also present, hence it should always be differentiated. When the strictures of the alimentary tract are below the stomach, bile is present in the vomitus. The vomiting of hypertrophic pyloric stenosis is quite a different type, is accompanied by visible peristaltic waves, and usually by pyloric tumor, and seldom appears before the second week of life. In congenital obstruction of the lower intestine symptoms may resemble hypertrophic pyloris stenosis, but vomitus is bile stained.

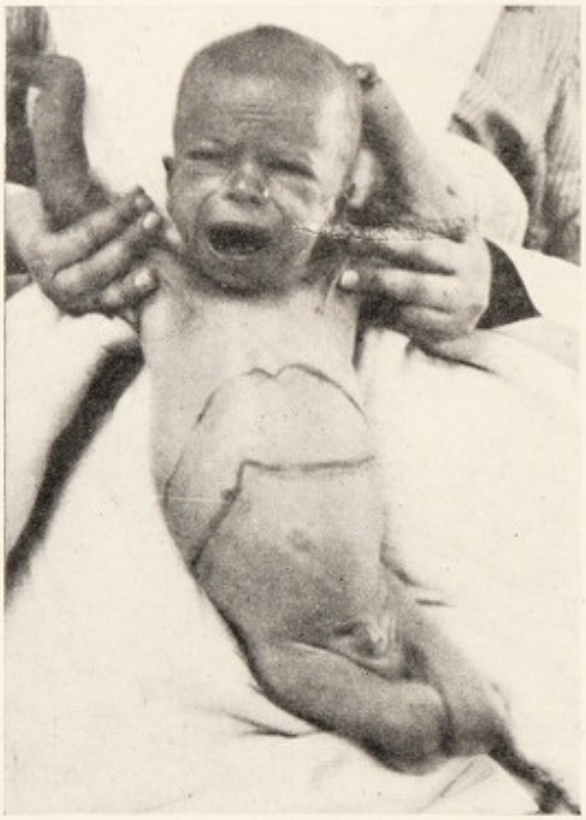


Fig. 55.—Congenital occlusion of the bile ducts. Five months old. (Foote.)

Congenital occlusion of the bile ducts, or congenital absence of the bile ducts, was first written of by Thompson. We collected 92 cases and showed that in many of these, as in our own case, when the patient was able to live a month or more, the accessory pancreatic duct of Santorini was present. (Fig. 54.) Few patients live more than three or four months. They are jaundiced persistently, have bile-free, white stools,

and are anemic. The prognosis is hopeless. (Fig. 55.) The patient pictured here lived to be six months old.

Atresia of the urethra has been spoken of in connection with hypospadias. It demands immediate relief. Sometimes an external opening is found which is closed off inside the glans. Distended bladder and evidences of pain should make it desirable to attempt to pass a small sound. This will determine whether or not the canal is patulous.

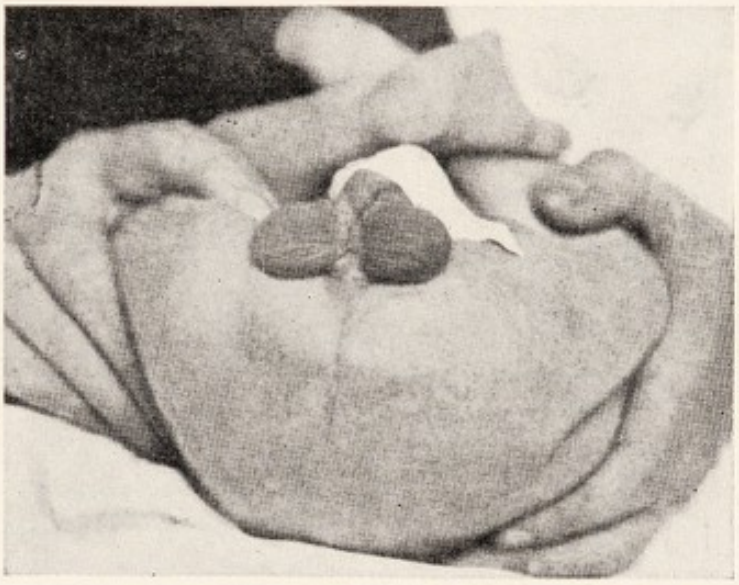


Fig. 56.—Atresia ani. The skin passes over the anal spot without a fossa, but with distinct raphe. The skin is bulged out by the ampulla. The scrotum is divided. Successful operation. (Pfaundler and Schlossman.)

Occlusion of the anus, or rectum, is not rare, and requires early operative treatment. Sometimes in females the rectum opens into the vagina. The diagnosis is made by inspection. (Fig. 56.) Early operation on the simpler forms of anal occlusion gives very satisfactory results. Pyelitis is the most frequent complicating sequel of operation in artesia of the anus.

Megalacolon, or Hirschsprung's disease, is a congenitally overdeveloped large intestine, with greatly thickened and widened walls. While the condition is a congenital one, Finkelstein states that the characteristic paralysis of the rectum and pelvic floor has not so far been observed in the new-born child. Great abdominal distension is apparent from the first days of life.

Congenital Tumors

Carcinomata of the stomach and œsophagus have been described in the new-born, but are extremely rare. The round-celled sarcoma is the most frequently found congenital tumor of the liver.

Primary carcinoma of the liver has been found in the new-born, but *sarcoma* is much more frequent. *Angiomata* are also frequently found, both diffuse and cavernous.

Hemangio-endothelioma is a very characteristic tumor of the liver, of the sarcomatous type, yet not forming metastases and seen only in the new-born. Foote collected ten cases from the literature. Non-malignant hepatic cysts are sometimes found at birth.

These liver tumors usually grow rapidly after birth, and present an abnormal outline to the palpating finger. They are usually fatal in a few months. Ascites and jaundice occur when the tumor presses on the vessels and ducts in the portal fissures, but not otherwise.

In the malignant hemangio-endotheliomas jaundice and ascites are not present.

Among congenital tumors, those of the *kidney* are undoubtedly the most frequent. Although symptoms of growth are not apparent sometimes till the infant is several months old, there is little doubt that the tumors are present at birth. They belong to an embryonic type of growth, and usually are called adenosarcomata. Congenital multiple cysts of the kidney are a developmental anomaly, and may not be diagnosed till later in life. They are not malignant growths, but may cause death.

Metastases are rare in these tumors unless they are operated on.

FIG. 57.—Inferior surface with cut section showing nodules.

FIG. 58.—Superior surface.

Hemangioendothelioma of the liver in the infant. (Photographs of hardened specimen by Martin, National Geographic Society.)
From "Contributions to Medical and Biological Research," dedicated to Sir William Osler, Vol. II. Paul B. Hoeber, Inc., Publisher.

Undoubtedly, as Steffan says, the after operation prognosis need not necessarily be hopeless if diagnosis is made early enough. But diagnosis is seldom made until the tumor has grown large enough to call attention to its size in palpating the abdomen. We have seen sarcomatous kidneys

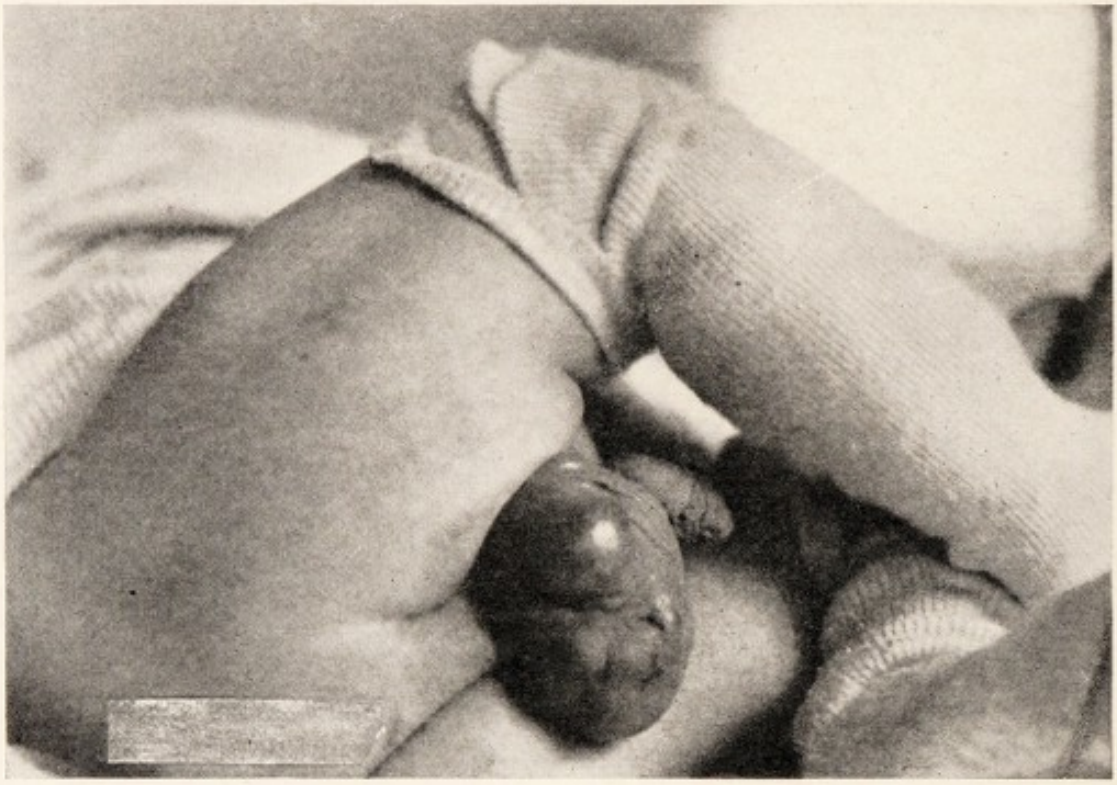


Fig. 59.—Infected teratomatous multilocular cyst of the testicles. Three weeks old. The cyst ruptured spontaneously and the child recovered. Children's Hospital, Washington, D. C.

removed in children when the tumor mass was relatively small, and yet metastatic growths have invariably appeared. Their extreme malignancy makes any early operative treatment of doubtful value.

Mixed tumors, or teratomata, may be found in any portion of the body. The familiar developmental dermoid ovarian cysts in the female are examples of mixed congenital tumors. A cystic teratoma of the testicle is shown in Fig. 59. This cystic growth became infected, ruptured spontaneously and recovery occurred.

Of malignant tumors of the kidney and adrenal, Steffan found 34 out of 219 growths within the first year, but, though many of these were undoubtedly present at birth, means of diagnosing them are not available. Walker found out of 138 cases of sarcoma that 12 had been present at birth.

Papillomas and *sarcomas* of the *bladder* have been described as congenital tumors, but usually are seen later in life. Electric dessication is the treatment.

Exostoses of the bones are congenital and are considered to be hereditary. They occur most frequently on the shafts of long bones and are benign. The same is true of *enchondromata,* which are likewise multiple in origin and found on the extremities. Malignant growths of bone, as sarcoma, are practically unknown in the new-born. Brain tumors are also almost unknown.

Primary tumors of *lymphatic glands* are very rare in the new-born, but cavernous *lymphangiomata,* especially of the tongue, have been found at birth. This is shown by an extreme macroglossia which may increase with age. The surgical treatment is often unsatisfactory.

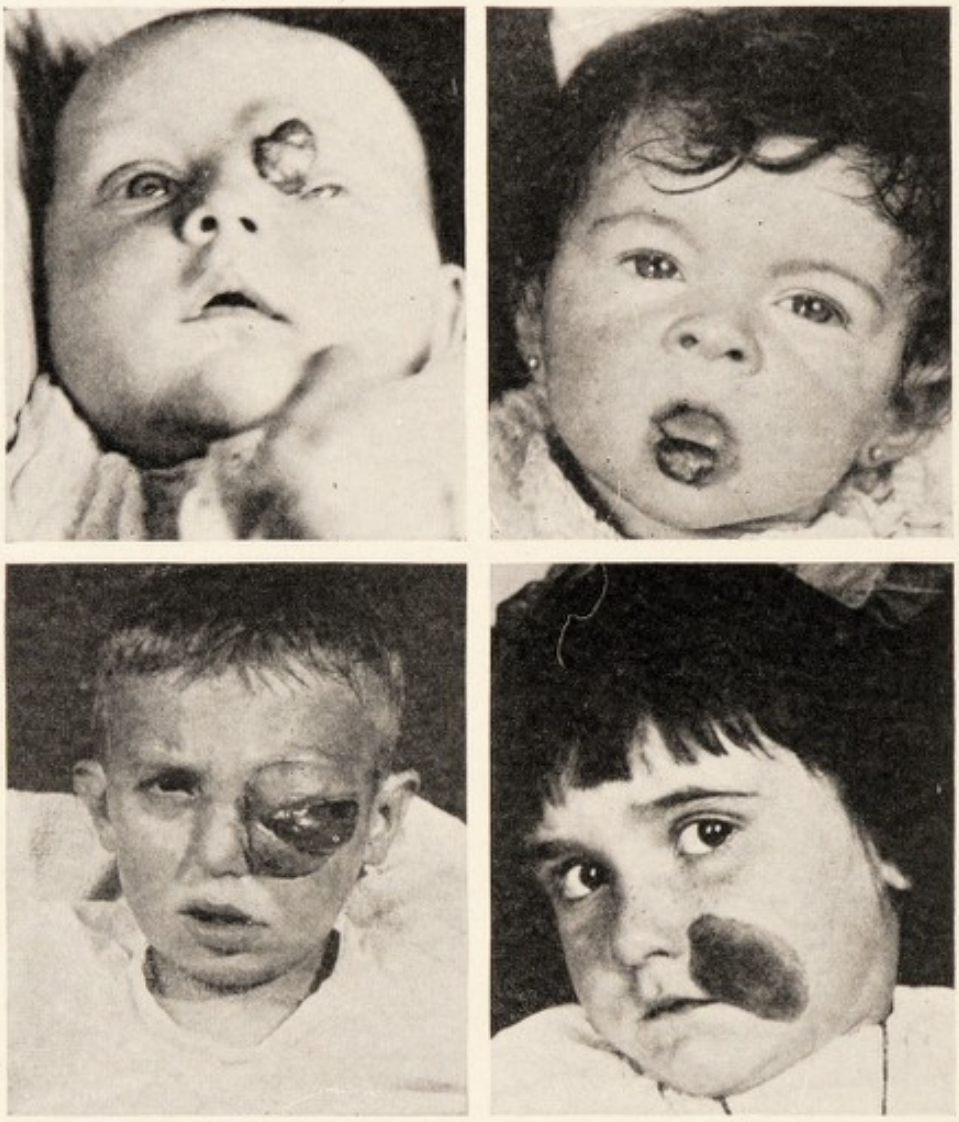
Sarcoma of the ovary in childhood has been reported in about 100 patients according to Mengleberg, who believes that many are of congenital origin, though diagnosed much later. Dermoid cysts of the ovary are perhaps more frequent in the new-born.

Ovarian tumors are difficult to differentiate in young children from tumors of the kidney. The latter usually shows intestinal tympany in front of it, and the X-ray shadow may show its origin. Cahill has collected the literature on ovarian tumors in childhood.

Sarcomata of the small round-celled variety are the predominating type of congenital sarcomata. Teratomata of the

testicle may be found in the new-born, but, according to Griffith, are extremely rare.

Nevus, or "*birthmark*" or *moles,* are names applied to



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Naevi and Angiomata. (Courtesy of Dr. W. L. Clark.)

FIG. 60.—Cavernous angioma of orbital region. 61. Simple angioma of lip. 62. Mixed cell sarcoma springing from the ethmoid. 63. Simple pigmented naevus.

various congenital growths of the skin, some of which are vascular, as the "port-wine stain," others pigmented, usually called moles.

The *vascular nevus* is made up of a group of capillaries

which form a mass of red or bluish spots in the skin, flat or very slightly elevated, and disappear on pressure. The face is a frequent site for vascular *nevi.*

In *cavernous angiomata,* the blood-vessels are large, dilated and tortuous, and if the tumor occurs on the surface, it may be elevated and pulsating.

Hemangio-endotheliomata are malignant tumors related to sarcomata.

Pigmented nevus, or *moles,* are often seen on the face, neck or back, and may be of varied sizes and more or less deeply pigmented, and covered with hair. Cuboid epithelial cells in the cutis, heavily pigmented, with pigment deposit also in the corium are found in these moles.

Treatment.—Carbon dioxide snow, in the hands of the dermatologist, and various electrolytic measures have been employed in the removal of *nevi,* whether pigmented or angiomatous. Surgical removal is indicated in rapidly growing nevi.

Of splenic tumors the endothelial infiltration known as Gaucher's disease probably is congenital. Knox, Wahl and Schmeisser found one case at two months of age. Enlargement of the spleen and leucopenia are the outstanding early symptoms. Unless the spleen pulp shows the characteristic endothelioid cells specific diagnosis is difficult. Splenectomy is recommended (Hermann and Roth).

Suprarenal gland sarcoma is probably congenital. Frew found a new-born, two weeks of age, in whom a primary growth was present in the medulla of the gland. Metastases are very common, and the abdominal tumor may not be found till late in the disease. Tumor of the right suprarenal is usually larger than of the left, and is frequently diagnosed more early

in the course of the disease. Metastases are found in the brain, liver, diaphragm, sternum, lymphatic glands, pericardium and lungs. Exophthalmos often follows brain metastases. These tumors are inoperable.

Congenital tumors of the thyroid are almost invariably *teratomata,* and are not therefore made up of thyroid tissue. They are seen principally in prematures. They grow rapidly and may cause suffocation. Early surgical treatment is indicated once a diagnosis has been made. Hunziker has collected only 24 cases from the literature of the last 200 years.

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CHAPTER XII

DIAGNOSTIC AND THERAPEUTIC MEASURES IN THE NEW-BORN

By JOHN F. O'BRIEN
Clinical Professor of Pediatrics, Georgetown University School of Medicine, and
JOHN A. FOOTE

Extraction of Breast Milk

The obtaining of breast milk by "milking", or expressing the milk from the mother's breast by means of the fingers rather than by the breast pump, is now a well recognized pro-

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Fig. 64.—Manual expression of breast-milk.

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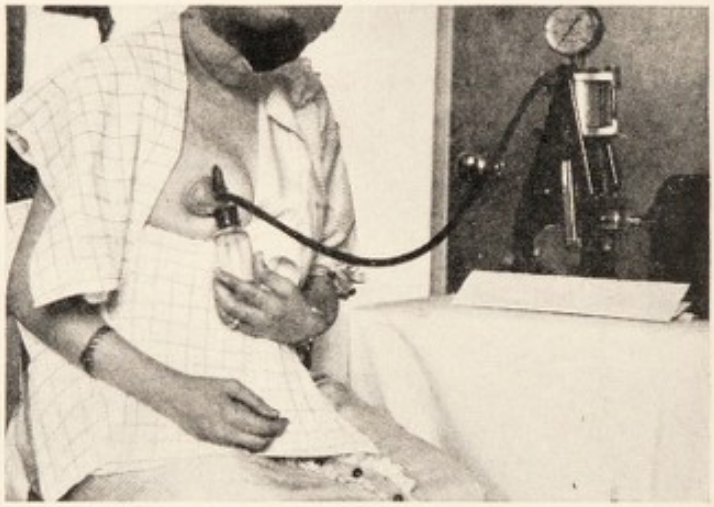

Fig. 65.—Use of Abt breast-pump.

cedure. The work inaugurated by Sedgewick proving the value of such procedures in stimulating the poorly secreting breast to the production of a larger quantity and better quality of milk, was an outstanding contribution of incalculable value to the present-day program for child health. (Fig. 64.)

Various modifications of the original method have been suggested. The principle of all is the same, namely, to place

the finger and thumb, well lubricated, separated by the skin outside the pigmented areola surrounding the nipple, and bring them together with a rubbing, or pill-rolling movement, just behind the nipple, at the same time making slight traction on the base of the nipple. The accompanying illustration is self-explanatory. Even though the milk so extracted should not be utilized, the performance of this "stripping" of the breast after each nursing will cause a sharp increase in both the quantity and the quality of the milk secretion.

The milking machine (Fig. 65) of Dr. Isaac Abt is also an excellent stimulator of breast secretion, though it is also advisable to strip the breasts by hand after using the machine. The machine is valuable in drawing out the retracted nipples, especially in primiparas. It is almost invaluable in institutions where wet nurses are employed.

Spinal Puncture

In spinal puncture, or lumbar puncture, the hollow needle is pushed into the arachnoid space at the lower level of the third or fourth lumbar vertebra.

In the new-born child this procedure is somewhat more difficult than in the older child, because of the smaller intervertebral spaces and the lack of development of the spinous processes and the intravertebral ligaments. In the new-born the following points should be observed:

1. Always enter the needle in the median line of the spine directly through the ligament, to avoid puncturing the vertebral veins which lie laterally in the vertebral canal.

2. Always use a small gauge needle, not larger than 20. The needle must be sharp and not rusty. The ordinary needle used for intravenous transfusion is quite suitable.

Position.—The child is placed on a small table, his back to

the operator, his head to the operator's left hand and facing the assistant. The assistant with his right hand grasps the child by the neck, near the shoulders, and with his left grasps the thighs near the knee, and sharply flexes the thighs on the abdomen to such an extent that the child's back is made convex. Lack of alignment between shoulder and hip must be prevented if the child attempts to struggle. (Fig. 66.)

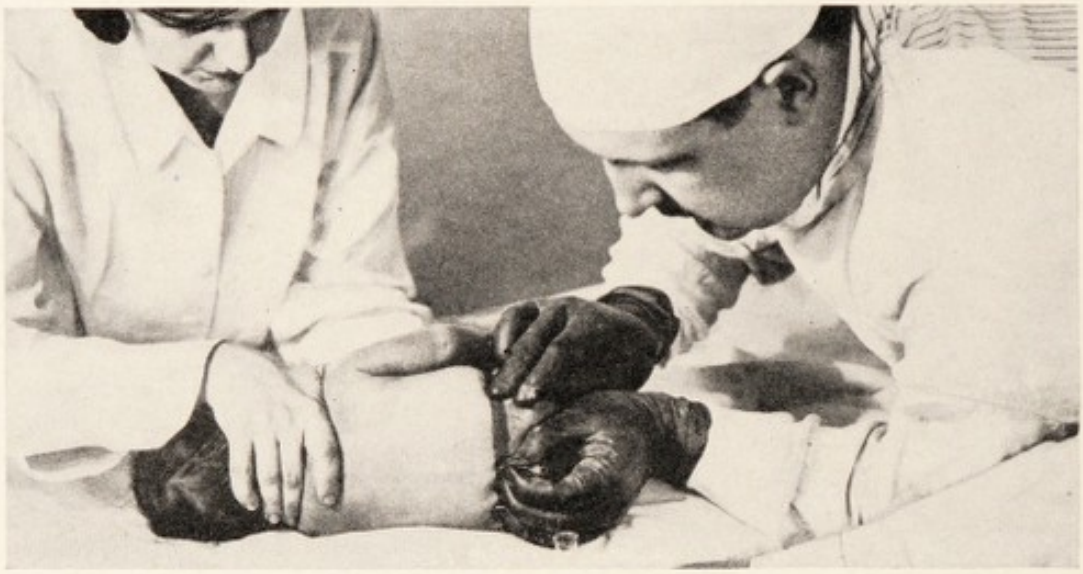

Fig. 66.—Spinal, or lumbar, puncture. Dark line painted above level of iliac crests. Assistant holds tube.

The back is washed with green soap, scrubbed with alcohol, and a line one-half inch in width, running perpendicularly from the spine of the ileum directly downward across the back, is painted with tincture of iodine. This should bisect the level of the fourth lumbar interspace.

Procedure

1. The child is brought to the edge of the table.
2. Sterile towels are placed under and over the field.
3. The operator wearing sterile rubber gloves, marks the level of the fourth lumbar interspace with the left index finger or thumb and grasps the needle between the thumb and first

two fingers of the right hand, the base of the needle resting in the palm of the hand.

4. The needle is passed in the soft space felt between the vertebræ at right angles to the plane of the infant's back, going first through the skin, then through the ligament, and finally with a release of resistance, into the vertebral space.

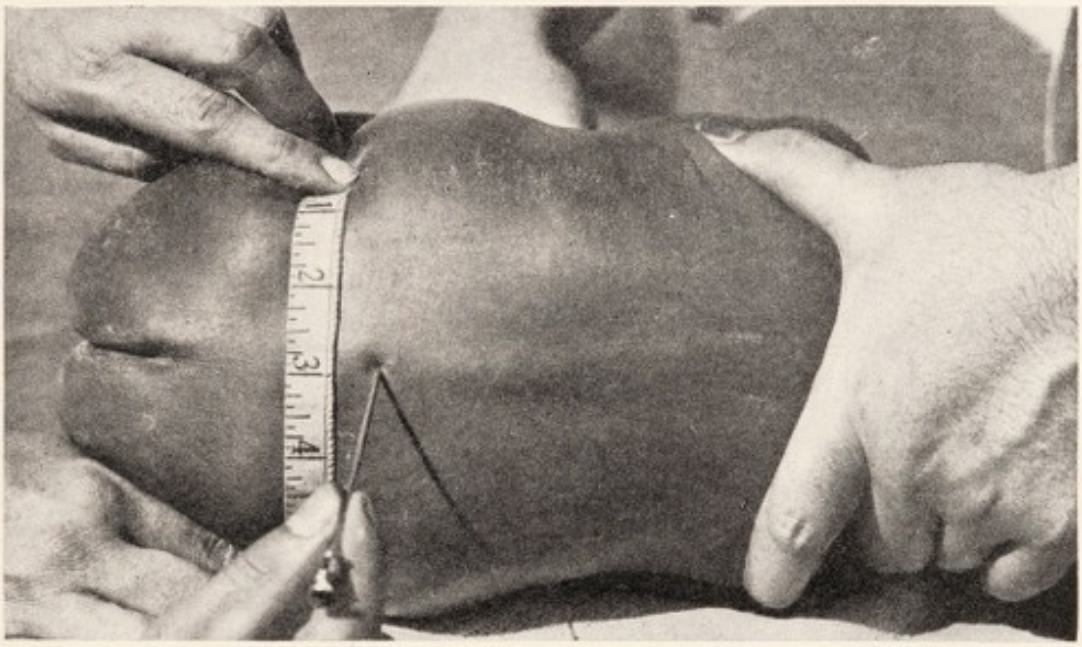

Fig. 67.—Landmarks for lumbar puncture. The needle is introduced in the intervertebral space just above a line drawn at the level of the iliac crests.

It enters the medullary canal in the new-born at a depth of one-half to three-fourths of an inch. (Fig. 67.)

5. The obturator is withdrawn. If fluid does not follow, rotate and very slightly withdraw the needle. If no fluid appears now, push the needle very slightly forward. If after half a minute, thick secretion is seen, blocking the needle, a syringe containing normal salt solution may be attached to the needle and a *very small* quantity injected, and then aspirated. This often serves to establish the flow.

6. If the canal has been properly entered fluid will drop or spurt out, depending on the amount of intracranial pres-

sure. In the new-born the normal rate of flow is about 30 drops a minute.

7. The presence of blood in the spinal fluid of new-born infants is not unusual. Very red fresh blood usually means contamination. Blood from subtentorial cerebral hemorrhage is at first not coagulated and is claret colored rather than crimson, and often coagulates in the tube.

8. Collect the fluid in sterile test tubes, reserving that in the second tube for the cell count.

9. Withdraw the needle and apply a sterile dressing fastened with adhesive.

Determination of Coagulation Time

APPARATUS:

Two clean watch crystals of equal size.
A human hair.
Alcohol.
Green soap.
Sterile sponges.

Method.—Cleanse heel of infant with green soap, apply alcohol and allow to dry.

Make a stab wound in heel prepared: *do not squeeze wound.*

Wipe away the first drop of blood and mark the time that the second drop appears. *Count from this time onward.*

Allow the blood to drop into watch crystal containing the hair.

Cover with the other watch crystal and gently rotate until the clot can be lifted up, which means coagulation. Then note the time.

The average in the new-born is 7 to 10 minutes.

Eye Irrigation

APPARATUS:

Irrigating can.
Rubber tubing, diameter 1/8 inch; length 3 feet.
Glass tubing, diameter 1/8 inch; length 2 inches.

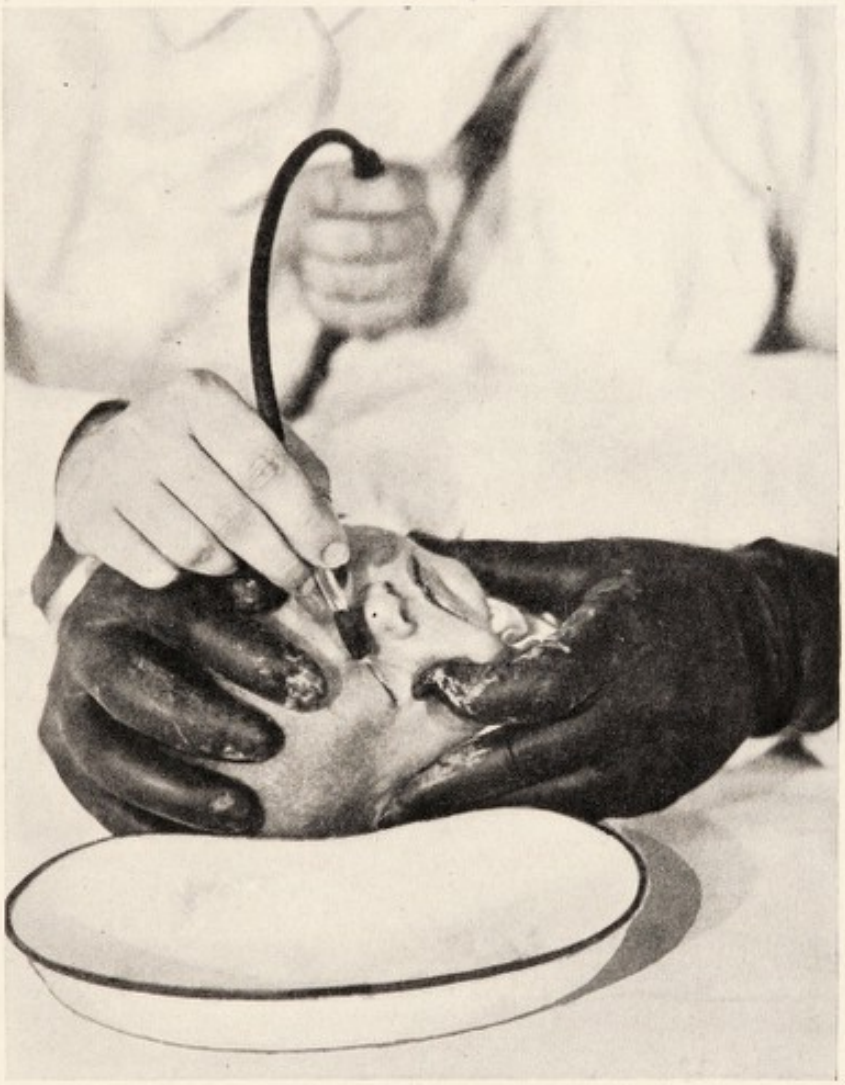

Fig. 68.—Irrigation of the eye in the new-born.

Rubber tip for glass tubing; diameter at proximal end 1/8 inch, distal end 1/12 inch.
Kidney basin.
Solution.
Gauze.
Cotton sponges.

Method.—The child is wrapped in a sheet, restraining the arms to its side, and feet together. The child is then laid on the table, with the eye to be irrigated farthest from the operator and lower than the other eye.

The kidney basin is placed under the eye to be irrigated and the uppermost eye covered with a piece of gauze. The irrigating can is placed 12 inches above the level of the eye and the solution allowed to flow slowly in the direction from the inner canthus to the outer canthus and into the kidney basin. If necessary, the palpebral fissure may be widened with a lid retractor.

Circumcision

Indication.—When prepuce is so tight that it makes retraction difficult.

A redundant prepuce which tends to retain urine.

Technique.—In babies ether should be given. The most satisfactory method is that described by Smith. The prepuce is split dorsally, the dogs ears trimmed off, all bleeding points tied. The skin and mucous membrane are united by two continuous sutures of No. 1 catgut, back sewing for half the circumference. A dressing of boric acid ointment is kept on the penis.

Catheterization of Urethra

FEMALE EQUIPMENT:

Soft rubber male catheter (7 to 9 French).
Catheter lubricant.
Sterile enamel basin.
Boric acid solution.
Argyrol, solution 10 per cent.
Sterile towels; cotton.
Green soap and water.
Alcohol 70 per cent.

Technique.—Restrain patient's arms to side. Child is placed in a recumbent position. The buttocks and external

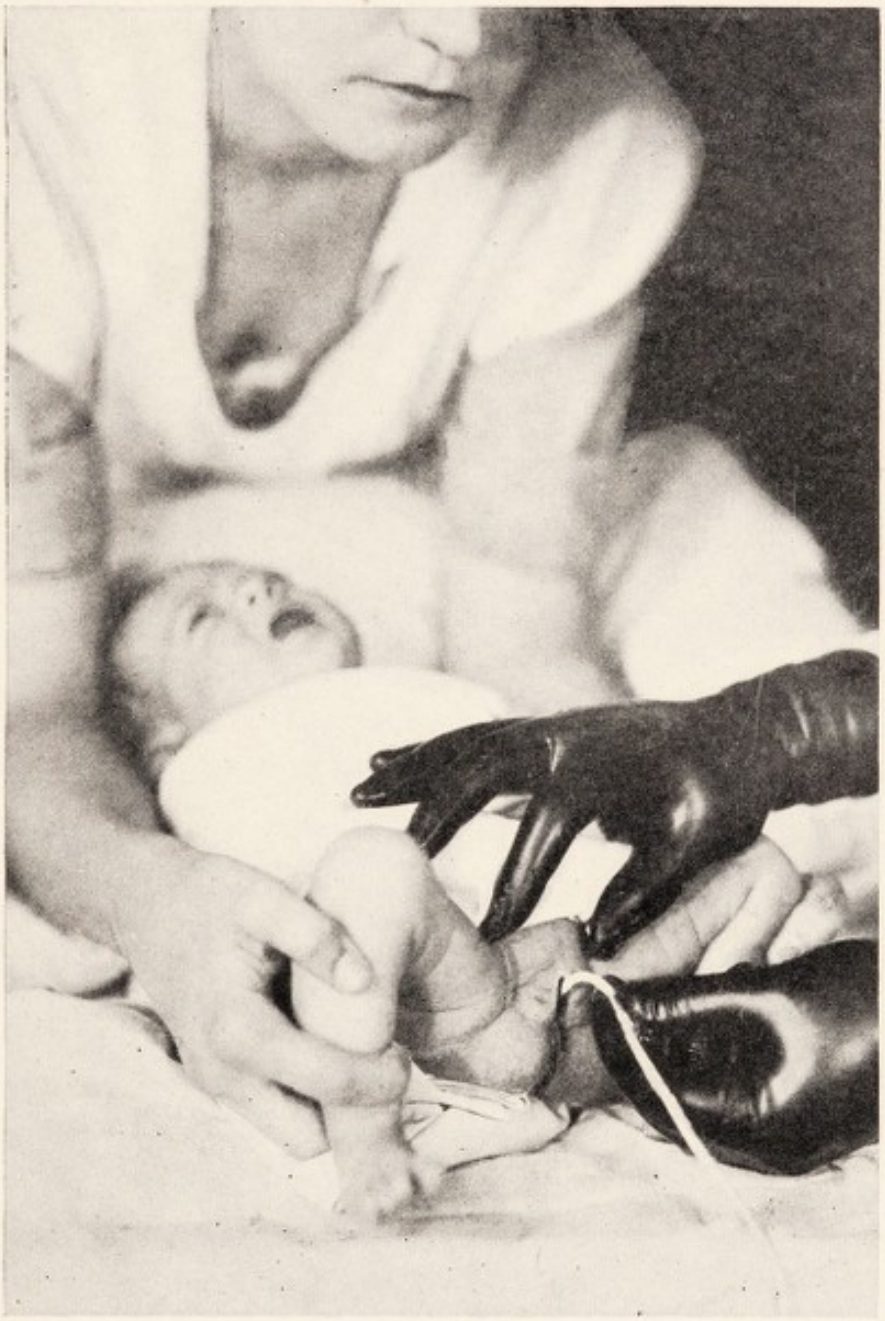

Fig. 69.—Catheterization of new-born female.

genitals are washed with green soap and water for five minutes and rinsed off with a 70 per cent alcohol solution.

The operator having sterilized his hands grasps the cathe-

ter with thumb and finger about one inch from its distal end, and having exposed the urethral orifice with his other thumb and finger, inserts the catheter. The urine is allowed to flow out and is collected.

FIG. 70.—Bladder lavage of new-born female.

MALE EQUIPMENT:

Male equipment is the same except that instead of French No. 7 to 9 catheter, an ordinary ureter catheter is used.

Procedure.—The child's arms are restrained to his side, prepuce is retracted and the head of the penis washed with green soap and water, and rinsed off with 70 per cent alcohol. The operator holds the corona between the fingers and thumb of his left hand. The catheter is held about 3 inches from the distal end with the finger and thumb of the right hand. Then with the penis held so that it makes an angle of 90 degrees with the patient's leg, the catheter is inserted from one to one and a half inches, then the penis is

lowered so as to make an angle of 45 degrees and the catheter inserted into the bladder. The urine is allowed to flow out and is collected.

Bladder Irrigation

Equipment is the same as for catheterization plus a glass irrigating reservoir, capacity at least 10 ounces, rubber tube, glass nozzle and cut-off.

Procedure, likewise, is the same as for catheterization, except that after the urine is withdrawn the glass connector of the irrigation apparatus is connected with the catheter, the reservoir is raised 12 to 18 inches and fluid allowed to run in; after 2 to 4 ounces have run in, the glass connector is detached and the fluid allowed to flow out. The process may be repeated as many times as necessary.

Rectal Injection and Irrigation

METHODS:

1. Irrigation with single tube.
2. Irrigation with double tube.

IRRIGATION WITH SINGLE TUBE

EQUIPMENT:

Catheter, No. 16 English.
Rubber tubing ¼ to ½ inch in diameter, 2 to 3 feet long.
Reservoir with stop-cock.
Bed-pan.
Petrolatum.
Solution.

Procedure.—Restrain the child's arms by wrapping in a large towel. Place the baby over a bed-pan. Having oiled the catheter insert it into the bowel about 1½ to 2 inches, and allow the solution to run in. After 2 to 3 ounces of the solution has run in, push the tube in the rectum up to about 6 to 8 inches. Hold the container at about 1 to 1½ feet above level of bed-pan and allow 6 to 8 ounces of the solution to run in. Detach the catheter from the rubber tubing and allow the fluid to escape from the rectum. If desired, the child may be allowed to expel it. This process may be repeated until a quart or more of the fluid has been used.

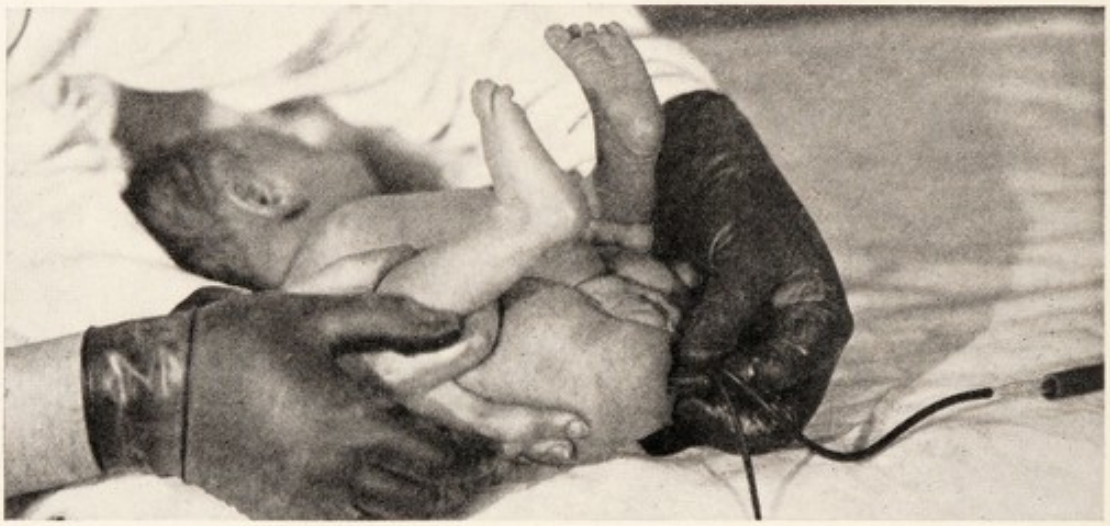

FIG. 71.—Rectal injection and irrigation with double tube.

IRRIGATION WITH DOUBLE TUBE

Equipment is same as for single tube irrigation, with the exception that No. 12 and 14 English catheters are used.

Procedure is the same as for single tube, with the exception that the No. 14 catheter is inserted about 1 to 2 inches farther than the No. 12 catheter. By alternately pinching the inflow and the outflow the amount of distension by the solution may be regulated.

Culture Taking in the Throat

EQUIPMENT:

Culture media.
Sterile swabs.
Tongue depressor.
Light:

Natural, or
Artificial.

Method.—The child is held on an assistant's lap, with the back of the child to her chest and the head held firmly with the left hand; the right across both arms and the chest.

Insert the tongue depressor and depress the child's tongue. Pass the depressor back until upon a gentle pressure the posterior pharyngeal wall and fauces come plainly within view.

Then touch with sterile swabs the tonsils, faucial ring and, if desired, the posterior wall of the pharynx and the epiglottis.

Gently rub the swab over the surface of the culture media, taking care not to injure the smooth surface. Cover the culture media and send to laboratory.

Culture Taking in the Nose

EQUIPMENT:

Tube of culture medium.
Sterile swab.

Method.—The child may be restrained as in throat culture taking, and a sterile swab passed gently into each nostril. Withdraw the swab and gently rub the cotton swab over the culture medium. Cover the culture medium and send to the laboratory.

Smear Taking

EQUIPMENT:

One-half dozen glass slides.
Small alcohol lamp.
Wood applicators.
Labels.
Absorbent cotton.
Sterile towels.

Technique.—The baby is placed on his back at the end of the table. The baby's thighs should be flexed on the abdomen and the legs on the thighs, and well separated.

The baby should not have voided before the examination, and there should be no preliminary cleansing of the parts.

The end of the applicator is wrapped with a very small piece of sterile cotton. The glass slides are labeled one to six.

Vulva.—The operator separates the labia with the thumb and index finger of the left hand, and passes the applicator over the surface of the vulvar canal where the secretions have collected; this is smeared over the center of two slides, No. 1 and No. 2, for about one square inch. The slides may then be allowed to dry in the air or fixed in the alcoholic flame. The operator should see that the smear is thin and transparent.

Urethra.—A very small applicator and film of cotton is used. The applicator is introduced into the external meatus, and the slides, No. 3 and No. 4, are smeared as above.

Vagina.—If the operator thinks it is necessary to make a smear from the vagina, the secretions are first wiped away from the vulvovaginal orifice, and, using a slide forceps as a speculum, a specimen of the discharge is collected on the applicator. The slides, No. 5 and No. 6, are smeared as above.

The slides are placed one upon another, with match stick between them and secured with two rubber bands. They are then wrapped in a sterile towel and sent to the laboratory.

Gastric Lavage and Gavage

Lavage

EQUIPMENT:

Soft catheter, size 12–14 English.
Glass connector.
Hard rubber funnel.
Rubber tubing.
Pitcher.
Basin.
Mouth gag.
Solution at 100–101° F.

Procedure.—The child is wrapped in a sheet and placed on his back, with his head near the end of the table. The distance between the tip of the nose and the ensiform cartilage is measured and this distance marked on the tube. The tube is lubricated by dipping it in hot water. The mouth gag is now inserted and the baby's mouth opened. The baby's head is steadied by an assistant. The operator stands to the right and a little back of the patient. The stomach tube is passed into the mouth with the right hand, and supported by the left hand against the roof of the mouth. The tube follows the curve of the roof, glides down the posterior wall of the pharynx, into the œsophagus, and finally into the stomach, where it is checked by the lower border, the point previously having been roughly measured and marked on the tube. Now the tube is withdrawn for about ¼ of an inch. The patient is turned on his side, the funnel is lowered to a point below the level of the stomach to allow fluid and gas to escape. The

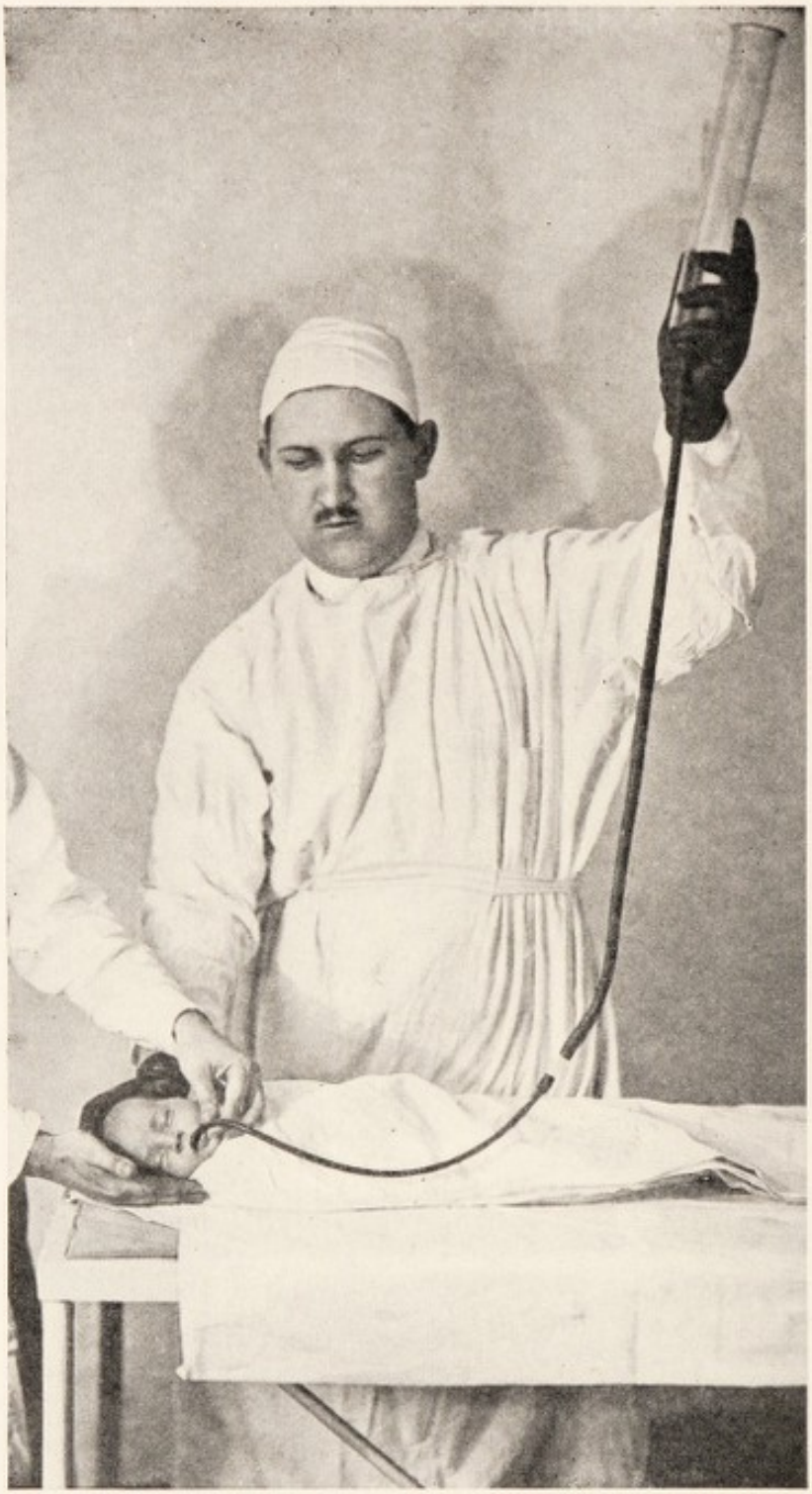

FIG. 72.—Gastric lavage.

funnel is held 8 to 10 inches above the stomach level, and 2 to 3 ounces of solution allowed to run in. Then the funnel is lowered below the level of the stomach and the fluid allowed to siphon off.

Repeat the process until the fluid returns clear.

Gavage

The equipment and procedure are the same as under lavage, except that after the irrigating fluid returns clear, the nutrient solution is allowed to gravitate into the stomach. The tube is firmly pinched between the thumb and forefinger and withdrawn.

Nasal Gavage and Lavage

The technique and procedure are the same as in ordinary gavage or lavage, except that the catheter is introduced through the nostril, instead of by way of mouth and pharynx.

Nasal Irrigation

EQUIPMENT:

Soft rubber bulb ear syringe.
Pitcher.
Solution 100° F.

Procedure.—The child is wrapped in a sheet, restraining the arms to the side. Then the child is placed on the end of a table and the head flexed over the waste basin. The left hand is placed on the baby's forehead and the head is supported firmly. With the little finger of the same hand the tip of the nose is raised. With the right hand the syringe is filled and the nozzle placed at the opening of the nostril, and in a plane parallel with the roof of the mouth. The bulb is squeezed gently and the fluid flows into the nostril. It escapes through the mouth and the opposite nostril. If the child's head is

flexed in the right manner and the fluid is forced in with gentle pressure, there is very little danger of fluid running into the Eustachian tube.

Intraperitoneal Injection

Use.—To give:

Normal saline solution.
Blood.
Ringer's solution.
Glucose solution.

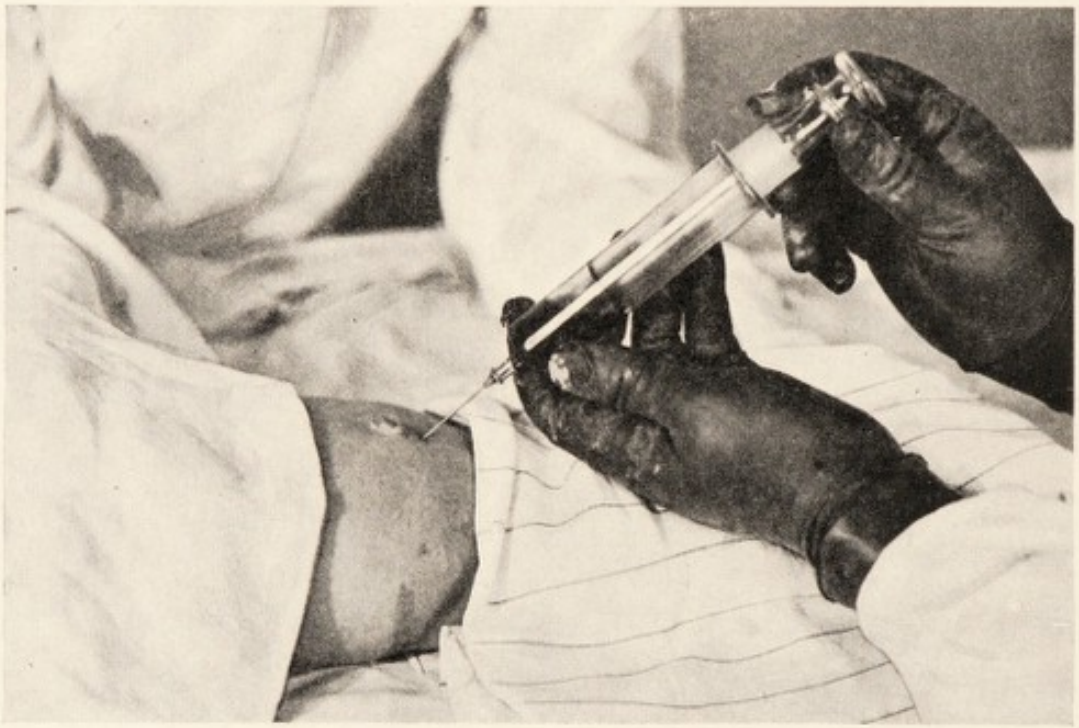

Fig. 73.—Intraperitoneal injection, syringe method.

Syringe Method

APPARATUS:

Syringe 50–60 cc.
Intravenous needles, size 16–17, with short bevel point.
Sterile basin.
Alcohol and iodine.
Sterile towels.
Sterile dressings.
Sterile sponges.
Adhesive plaster.
Two large towels.

Technique.—Care is taken to see that the child's bladder is empty. The infant's legs and arms are restrained by a large towel snugly pinned. Lay the patient on his back on the table. The abdomen is cleaned and prepared as if for a major operation, and finally the abdomen is draped. The operator picks up a fold of skin and integument of the abdomen ¾ to 1½ inches below the umbilicus with thumb and forefinger of left hand, and with the right hand the needle is inserted into the fold of skin and pushed in an upward direction through the abdominal wall. When the needle enters the peritoneal cavity it should then be depressed and the fold of skin dropped. The operator then fills the syringe from the fluid in the sterile basin and injects it. The temperature of the fluid injected should be about 100°.

Gravity Method

APPARATUS:

Graduated glass container. Intravenous needle, size 16–17
Two rubber tubes, size ⅛"–1½ feet long.
Glass connecting tube, size ⅛"–2 inches long.

Two metal adapters.	Sterile dressings.
Thermometer.	Sterile sponges.
Alcohol–iodine.	Adhesive plaster.
Sterile towels.	Two large towels.

Technique.—The procedure and technique are identical with those employed in the syringe method, except that a container with the fluid is held about two feet above the level of the site of injection. The fluid is then allowed to run through the tube, and a few cc. are run into a warm glass containing a thermometer. If the solution is found to be about 100°, the connection is made with the needle, and the fluid is then allowed to flow into the abdomen.

Intravenous Injection

Syringe Method

Use.—When small amounts of fluid are to be injected as from 5–60 cc.

APPARATUS:

Rubber tourniquet.

Syringe 50–60 cc.; needle should be, (1) sufficiently large

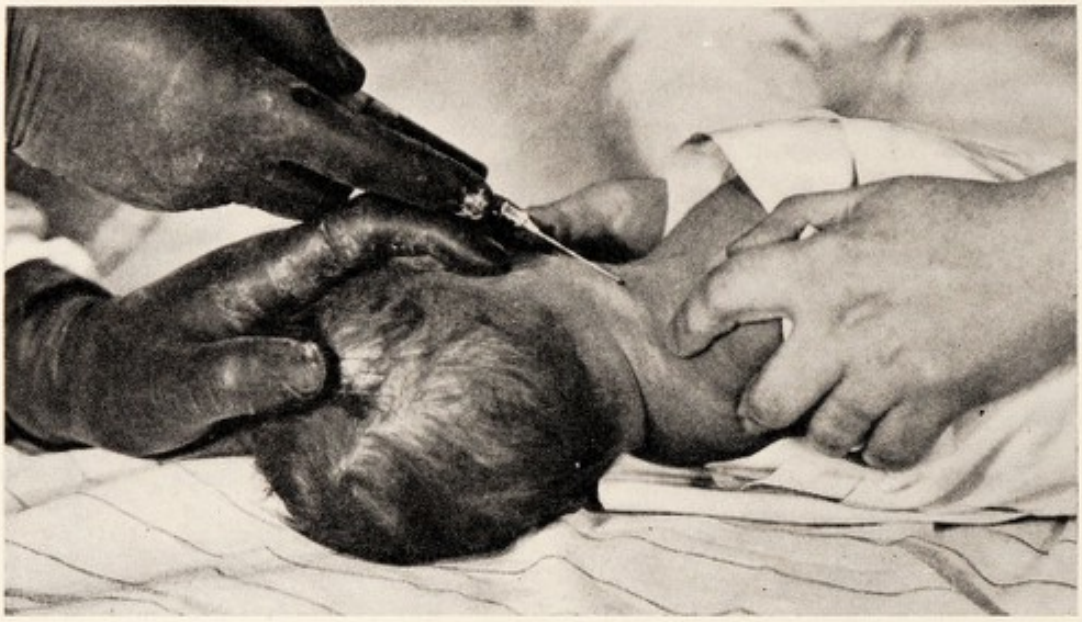

Fig. 74.—Intravenous injection, syringe method, using the external jugular vein.

(size 18–22), (2) short beveled edge, turned down, in order to prevent perforating the posterior wall.

Material to be injected.

Sterile gauze and sponges.

Bandage.

Iodine–alcohol.

Fine needles.

Catgut 00 and fine silk thread.

Scalpel.

Hemostats.

Small retractor.

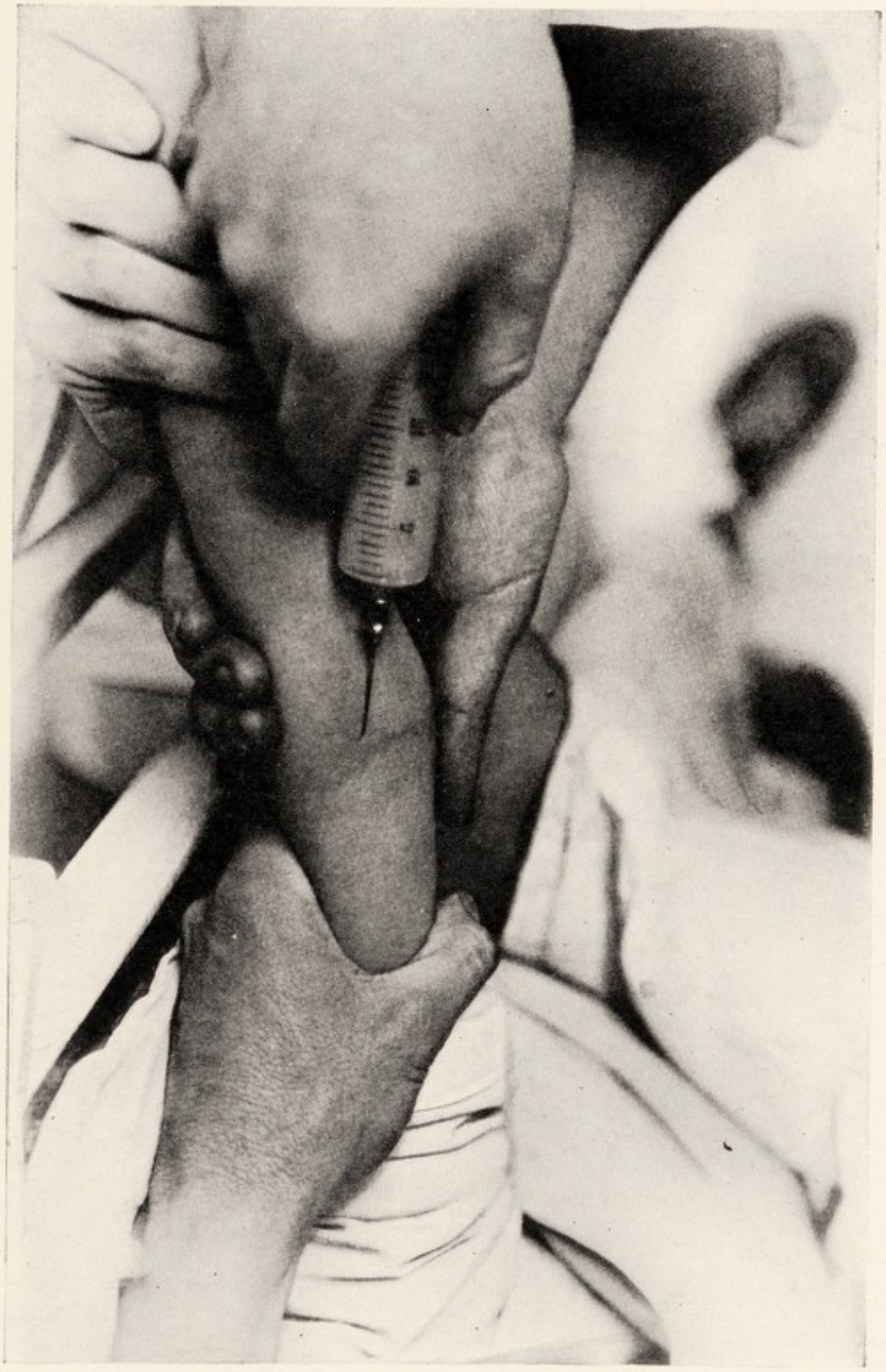

Fig. 75.—Injection through the median vein or in its branches at the bend of the elbow. Children's Hospital, Washington, D. C.

Method.—(A) The rubber tourniquet is applied above the elbow. The patient's arm is steadied by an assistant. The site of injection is selected (usually a vein at elbow), the skin is sterilized with iodine and alcohol.

The operator then steadies the skin over the vein with his left thumb and forefinger and introduces the needle into the vein. A flow of blood into the syringe shows that the vein has been entered. Then the tourniquet is removed and the injection slowly given. Some operators prefer, especially if syringe is large, to detach the needle from the syringe to pass it into the vein; when blood appears, the syringe is attached and the injection made. After the injection the needle is withdrawn, the puncture wound is then sealed with sterile gauze and bandaged.

(B) If the baby is very fat or the vein is very small it may be necessary to expose the vein by making a small incision over it, clamping and tying the bleeding vessels, retracting the tissue and exposing the vein. Then continuing as in method " A," with the exception that before the needle is withdrawn the vein is tied off on both sides. Then the tissues are closed by 00 catgut, and skin wound by black silk; sterile gauze dressing and bandage applied.

Gravity Method

Use.—If large quantities of fluid are to be given, this is the method of choice.

APPARATUS:

The same as that given under Syringe Method, except that in place of the syringe, we use a graduated cylinder, and rubber tubing with pinch-cock, which is furnished with a metal adapter that fits the needle. A glass window if placed

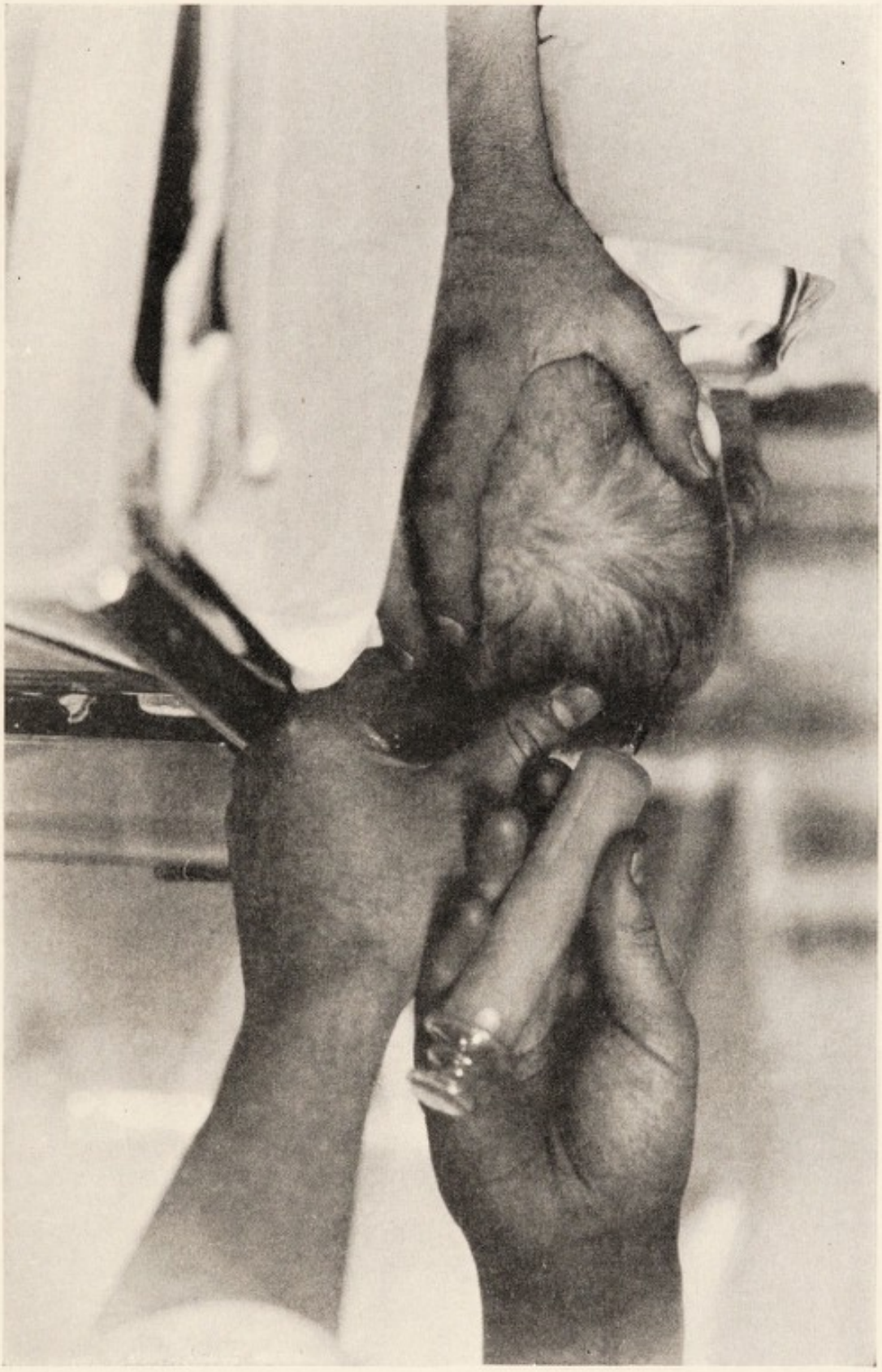

FIG. 76.—Injection through a vein in the scalp in the older child. Children's Hospital, Washington, D. C.

about two inches from the distal end of the tube will aid the operator in determining whether the needle is in the vein.

Method.—The graduated cylinder and tubing is filled with the solution to be injected, warmed to about 100° F.

The arm is prepared as in the syringe method. The needle is introduced into the vein, and when blood appears the tubing is attached to the needle, the tourniquet is removed and the injection given. As a rule the graduated cylinder should be elevated between 2 and 3 feet.

Intramuscular Injection

APPARATUS:

Syringe.
Intravenous needles—16-18 gauge.
Sterile towels.
Sterile sponges and sterile gauze.
Alcohol and iodine.
Adhesive plaster.
Sterile container.
Solution.

SITE OF INJECTION:

Gluteus muscles.
Back muscles.
Abdominal muscles.
Triceps muscle.

Method.—The site is prepared as if for a major operation. The skin and underlying tissue of the site of injection are slightly stretched. The needle is plunged deep into the muscle, and the solution injected slowly. Withdraw the needle and fasten a sterile dressing over the wound with a strip of adhesive plaster. Massage the muscle gently for a few minutes to aid in diffusion and to hasten absorption of the blood; after this apply a hot-water bag for the same purpose.

Superior Longitudinal Sinus Injection

Use.—To place blood or fluid in the infant's veins.

EQUIPMENT:

Green soap.
Sterile towels.
Iodine, 20 per cent solution.
Spinal puncture needle or Goldbloom needle.

Technique.—The scalp area should be prepared as for a

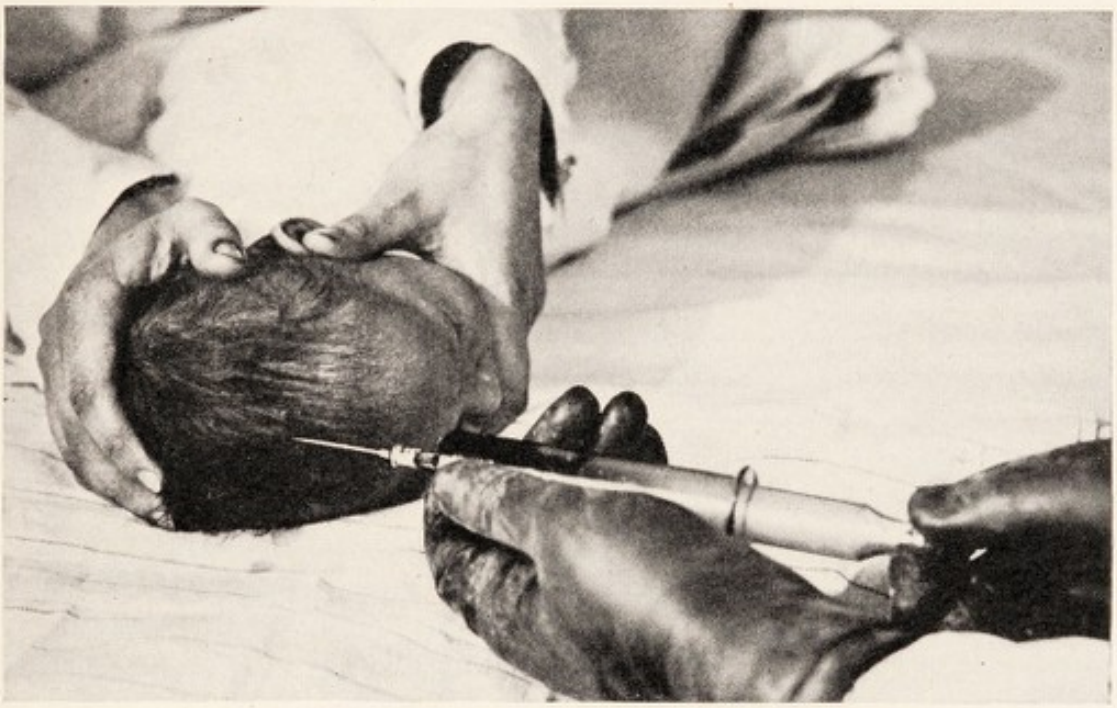

Fig. 77.—Superior longitudinal sinus injection—syringe method.

major operation. The child's head resting on the occiput is firmly held by an assistant. The needle, with the syringe containing the solution attached, is inserted in the midline in the posterior half of the anterior fontanelle. It should be held and inserted at an angle of 25–30° and directed towards the occiput. This should be done very gently, and the insertion stopped with the disappearance of the resistance at 4 to 8 millimeters, as the sinus has been entered. Definite assurance

that the sinus has been entered can be had by applying suction, and obtaining blood. Then transfuse.

Cisterna Puncture

PRINCIPAL USES:

1. Obtaining cerebrospinal fluid, especially when spinal puncture fails.
2. Introduction of serum.

APPARATUS:

Spinal puncture needles, not larger than 20 gauge (1½–⅝ an inch shorter than the standard), and to which a manometer may be attached.

Manometer.

Test tubes (small—sterile and clean).

Alcohol and iodine.

Table.

Technique.—The patient's skin should be scrubbed with water and green soap, and then wash with iodine and alcohol. The table should be elevated in such a way as to make an incline of about 5–10°. The patient is then placed upon the table in a recumbent position, with the head toward the lower part of the table. A plane passed through the glabella and the upper edge of the external auditory meatus, when carried backwards will pass through the occipito-atloid ligament. In very thin babies a deep depression may be palpated between the spine of the axis and the occipital protuberance. This depression serves as another landmark. With the above as a guide the spinal puncture needle is introduced into the midline of the back of the neck right above the spine of the axis. The depth of the introduction is about

3–5 cm., the average being 4 cm. The stylet should then be removed slowly so that only a few drops come out at first. Then the stop-cock turned to prevent the escape of fluid, the manometer attached, and the pressure measured before the fluid is allowed to run into the test tubes. At the first indica-

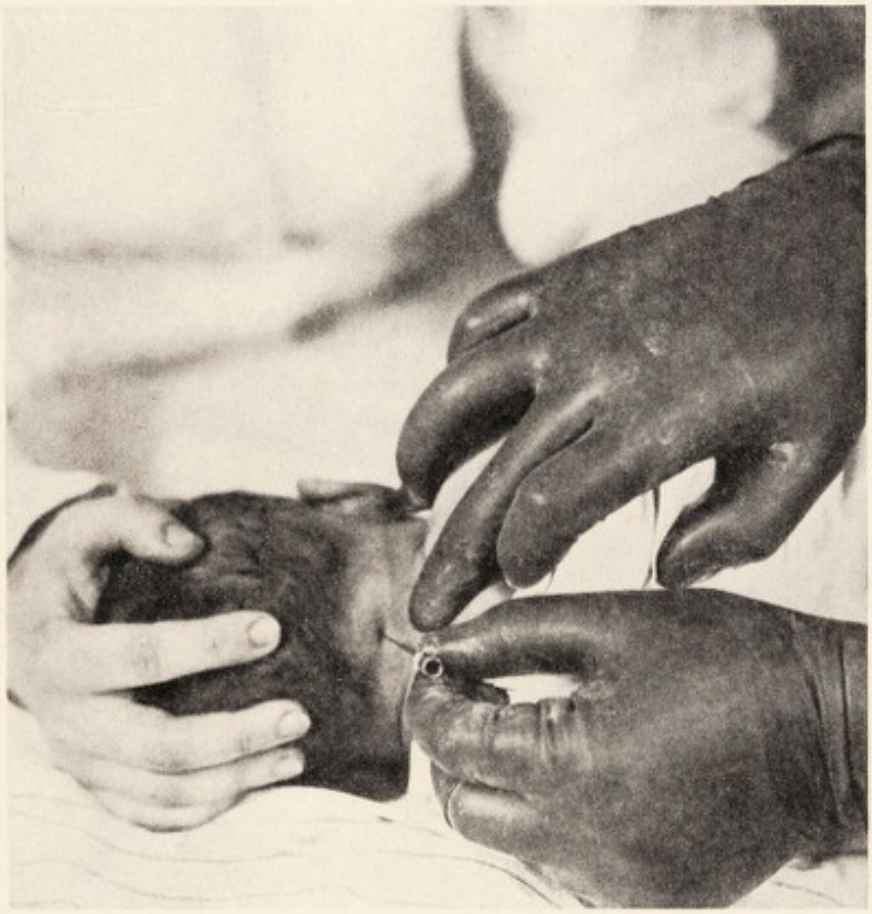

Fig. 78.—Cisterna puncture.

tion of shock, the spinal puncture needle is withdrawn and atropine given hypodermically (gr. 1/10,000 in the new-born).

Ventricular Puncture

Use.—Withdraw fluid or give serum.

Site of Injection.—One-half–1 centimeter to one side of the midline of the anterior fontanelle.

APPARATUS:

Spinal puncture needle.
Small test tubes.
Sterile towels.
Sterile sponges.
Sterile gauze.
Bandages.
Green soap.
Alcohol and iodine.
Sharp razor.
Table.
Gravitating outfit if serum is to be given.

Technique.—The patient is wrapped in a sheet restraining the arm to the side, and the feet together. Then the patient is placed in the recumbent position on a table, with the head at the end of the table. The head is shaved, washed with green soap and prepared as if for a major operation. The spinal puncture needle is introduced ½–1 centimeter to one side of the midline of the anterior fontanelle. It passes through the skin and meninges, and is directed forward and to a depth of 1–1½ inches through the brain substance until the lateral ventricle is reached. The stylet is now slowly removed and the fluid is collected into the test tubes. If serum is to be given the procedure is similar to that employed in the spinal route.

Treatment of Acquired Umbilical Hernia

EQUIPMENT:

Adhesive plaster 1½–2 inches wide.
Talc dusting powder.
Alcohol.
Green soap and water.

Procedure.—Place the patient on his back on a table, clean the abdomen with green soap and water, and rub with alcohol and allow to dry. Dust the dusting powder on to the

umbilicus, being careful to wipe away any which falls outside the depression. Take a strip of adhesive plaster about six

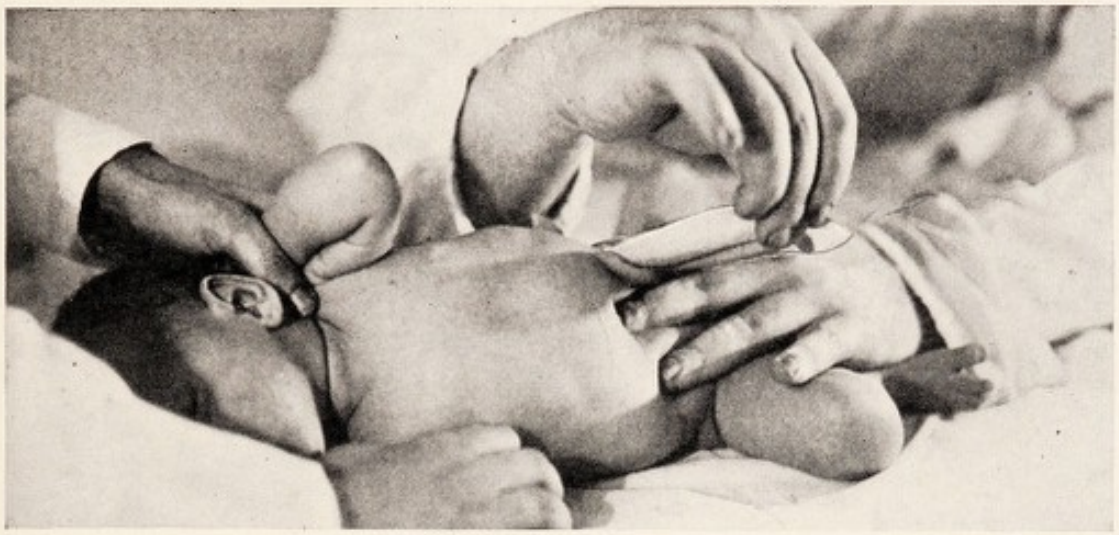

FIG. 79.—Infolding and strapping of acquired umbilical hernia—first stage of technique.

inches long: Apply three inches of the strip of adhesive firmly to one side of the abdomen, and make traction on the free end of the adhesive with the right hand. Reduce the hernia with the index finger of the left hand, keeping gentle pressure over the ring of the umbilicus so that the hernia will not return. With the index finger still in position grasp a fold of the abdominal wall of the left side of the abdomen between the thumb and index finger, a fold also on the right between the middle finger and index finger. Bring these folds toward the midline. The index finger is now withdrawn. At

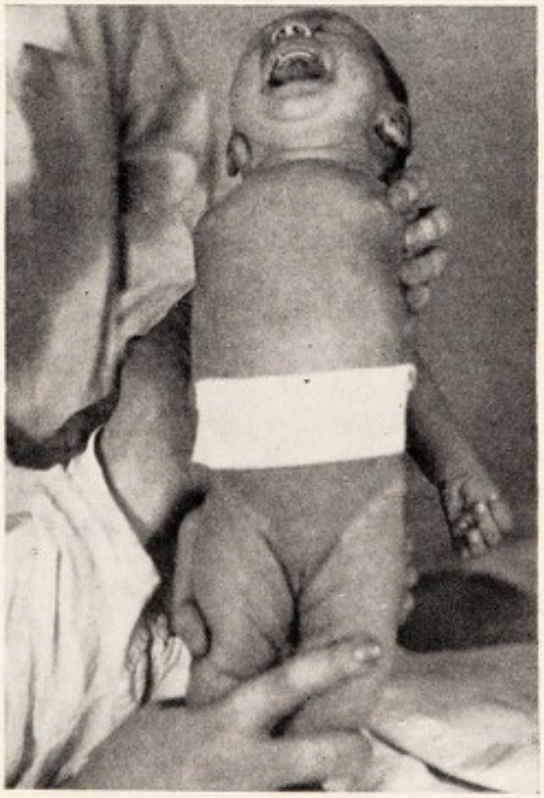

FIG. 80.—Infolding and strapping of acquired umbilical hernia—second stage.

the same time, draw the strip of adhesive over the umbilicus, and apply it to the opposite side of the abdominal wall. This inverts the umbilical depression and brings the peritoneal edges into apposition. Leave the plaster in place until it loosens; then remove it and re-apply as above.

Reduction of Large Sized Umbilical Protrusions (*Foote's Method*)

When the umbilical protrusion is so large that it cannot be readily inverted by ordinary means, a special technique is employed. Take two strips of adhesive plaster, each 2 inches wide, and about 4 inches long, and cut them longitudinally so that a segment over an inch wide and about 2 inches long is removed from one side of each of these 4 inch strips. To accomplish this, place one strip on top of the other with the adhesive surfaces facing upward, and cut both strips at the same time. Apply the larger ends of these strips to each side of the abdomen so that this wider portion is about ½ to 1 inch from the protrusion, while the narrower portions of the strips parallel each other across the abdomen, as shown in Fig. 81. Simultaneous traction on these narrower strips together with slight pressure over the umbilicus will accomplish any degree of inversion desired. These two narrower strips are then pressed into place and a third strip about 1½ inches wide is fastened over all in order to make the dressing secure. (Fig. 82.)

METHOD:

Application of Truss in Inguinal Hernia

1. Gently reduce the hernia by manipulation.
2. If there is any difficulty in reducing the hernia apply an ice-bag over it; in about 10–15 minutes elevate the

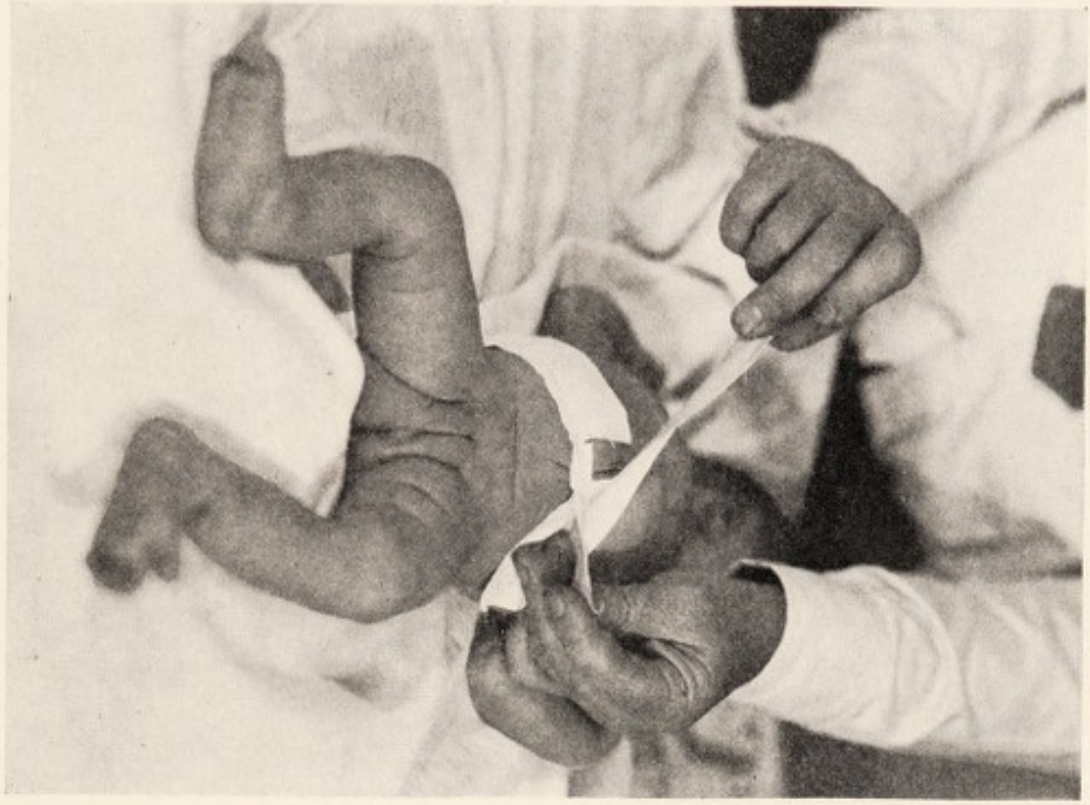

FIG. 81.—Reduction and strapping of large acquired umbilical hernia, Foote's method. (Note central crease produced by infolding.) First stage.

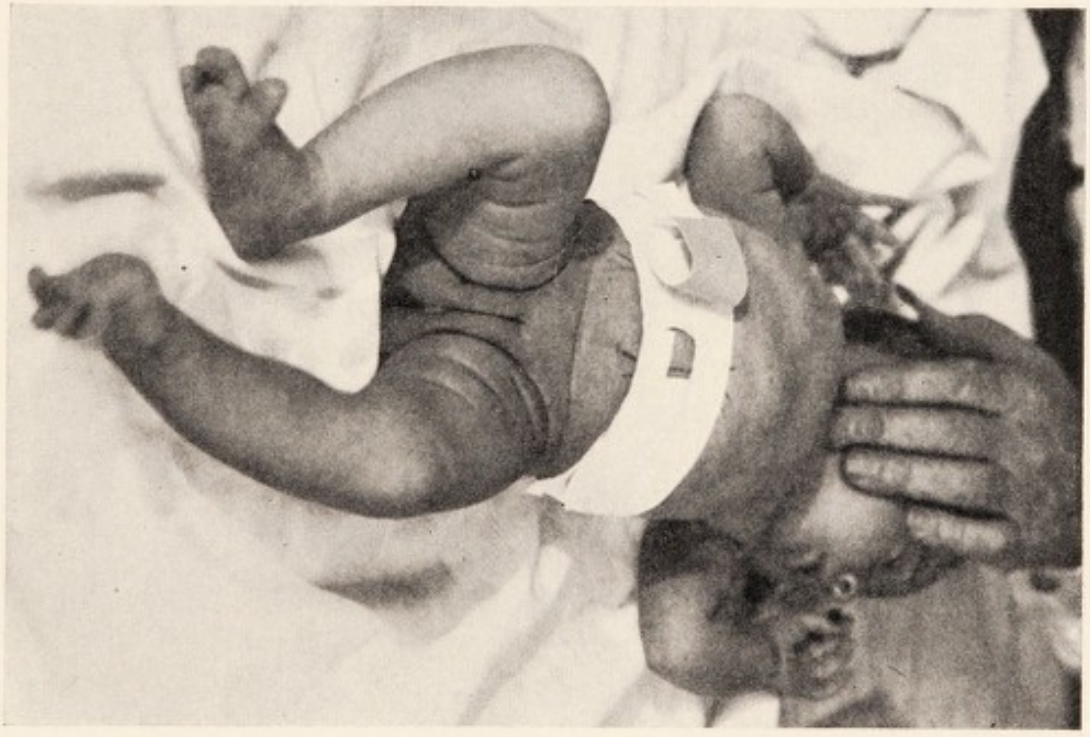

FIG. 82.—Reduction and strapping of large acquired umbilical hernia, Foote's method. (Note central crease produced by infolding.) Second stage.

pelvis, and by manipulation without pressure gently reduce the hernia.

3. Take 10–15 strands of Saxony yarn and of such length that they will go around the baby's body twice.
4. Tie the free ends of the yarn together. Then make a small loop at one end by tying the first turn of a surgeon's knot, leaving a long and short end to the extremities of the yarn. By running the opposite

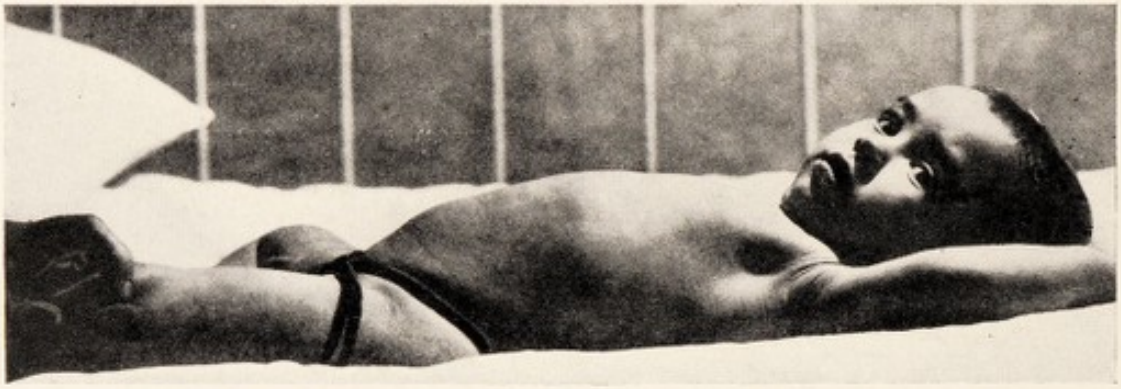

Fig. 83.—Yarn truss in inguinal hernia. Knot is over hernia in the groin.

end of the strand through this loop a "slip knot" loop should be made of sufficient diameter so that the leg on the same side as the hernia may be inserted in this loop.

5. Slip the loop over the leg and fit it snugly around the thigh and in the groin. See that the knot is over the inguinal opening. Now complete the surgeon's knot. Draw the knot tightly and turn it over.
6. Carry the right, or short free, end of the yarn across the knot to the left of the abdomen and around the trunk just below the brim of the pelvis.
7. Carry the left, or long free, end of the yarn across the knot to the right of the trunk just below the right superior spine.
8. Make firm traction and tie the free ends of the yarn.

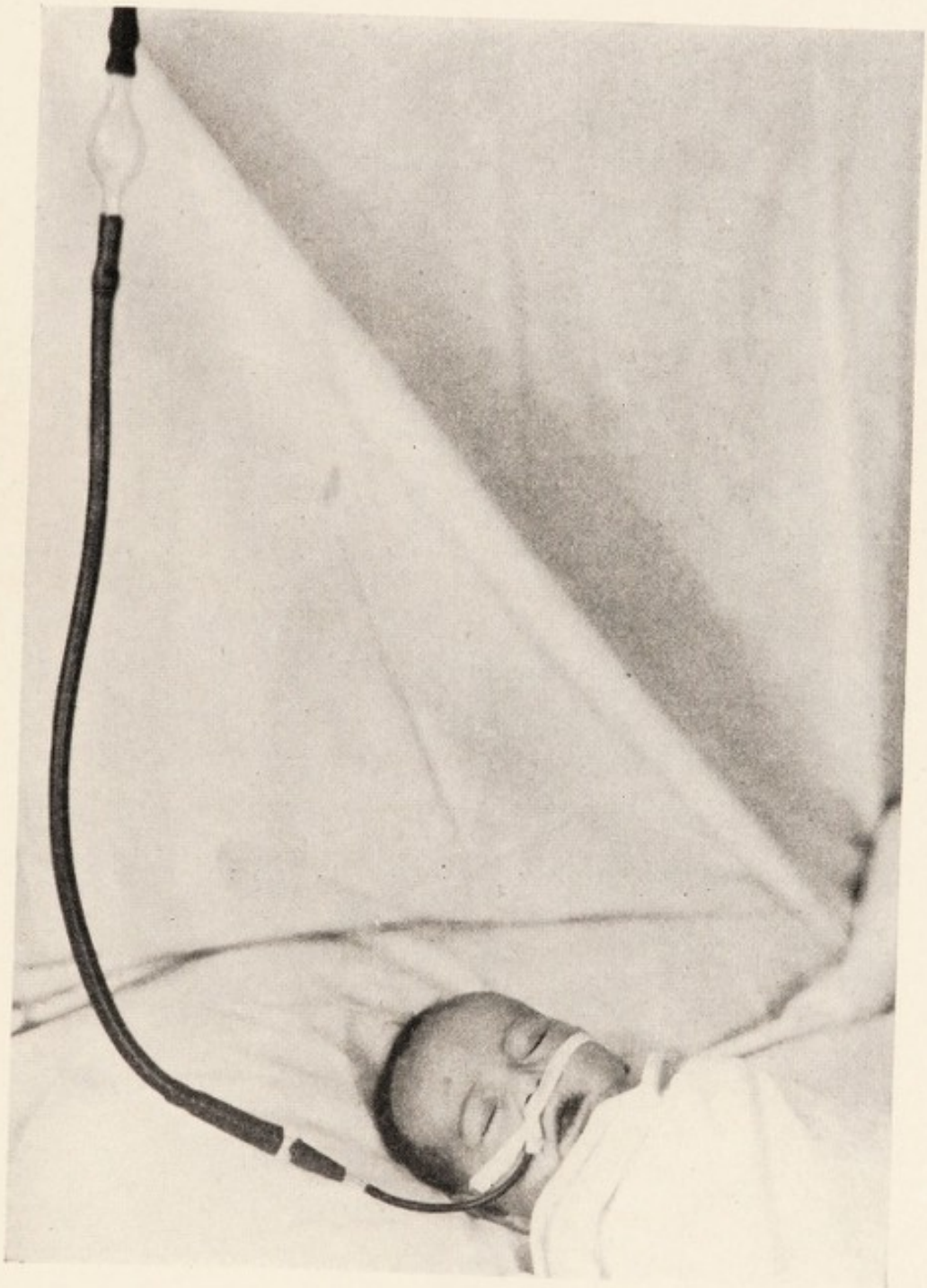

FIG. 84.—Nasal drip.

Nasal Drip

Use.—To give fluid slowly and continuously by gavage to dehydrated infants.

APPARATUS:

Graduated glass container.
Glass connector.
Rubber tubing, 3–4 feet long.
Stop-cock, and Murphy drip bulb.
Solution desired—at temperature 99–100° F.
Soft catheter, size 8–10° F., or small enough to slip easily into infant's nostril.

METHOD:

1. Restrain child's hands.
2. Connect apparatus as for a Murphy drip to be given by rectum.
3. Insert lubricated catheter into the nostril and gently push it backward until it reaches the œsophagus.
4. Fasten the catheter to the face with adhesive plaster.
5. Raise the container about 3 feet above the infant's head and adjust the stop-cock so that the fluid drops through the Murphy bulb at the rate of one drop every two to four seconds.
6. Connect the apparatus with the catheter.

Ear Irrigation

APPARATUS:

Irrigation can.
Rubber tubing, 2½–3 feet long, ⅛–¼ inch in diameter.
Glass portion of a medicine dropper with a rubber tip.
Solution for irrigation.
Kidney basin.
Ear syringe.

METHOD:

(A) Wrap the child in a sheet, then lay him on his back on a table with the head near the edge. Place the kidney basin under the ear to be irrigated. Hold the irrigation can 4–6 inches above the level of the ear drum, allow the fluid to flow. After making backward and upward traction on the pinna of the ear, insert the medicine dropper tip just

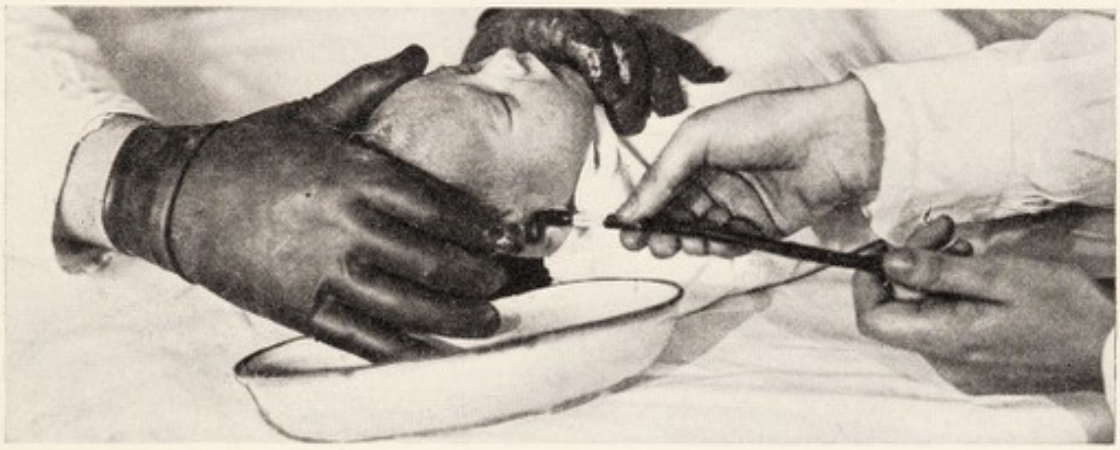

FIG. 85.—Ear irrigation, gravity method.

within the auditory meatus and allow the fluid to flow gently.

(B) If desired, a soft rubber bulb ear syringe (3 ounce capacity) may be used. In this case, the syringe is first filled with the desired solution. Traction is made upward and backward on the pinna of the ear, the tip of the syringe is inserted within the auditory meatus, and the fluid forced in gradually and gently. This may be repeated as often as necessary.

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CHAPTER XIII

HABIT FORMATION IN THE NEW-BORN

By JOHN A. FOOTE

THE new-born infant has become in recent years a very interesting personage to the psychologist. Battles are fought over the question as to what primary instincts he brings into the world with him, how these instincts are related to emotions, and, indeed, what are really instincts and what are merely reflex acts.

Pages might be written concerning these mooted topics, with little real benefit to anyone, and least of all to the child himself. Yet it may be helpful to know that though the infant has no habits at the time of birth, he very early forms mental associations and begins to connect cause and effect, and to distinguish between the pleasant and painful happenings. Crying is at first perhaps a purely reflex act, but when its performance is inevitably followed by something which gives the infant pleasure its repetition very soon becomes a thing of purpose—and of strength.

CONGENITAL FEARS

Psychologists of nearly all schools agree that the child is born with a few fears—the fear of a loud noise and the fear of falling being present so early that they may be considered instinctive. Many other kinds of fear, therefore, may be explained by their original association with a loud noise, or a fall—at least such is the belief of those who follow the "behaviorists," of whom Professor Watson is the leading authority, and these associations and their manifestations are called "conditioned reflexes."

Tenderness, or love for the mother, is also probably an instinct, and the emotion of pleasure when the child is " taken " by the mother is one that is self-evident almost from the beginning of life. That the infant's voice may come to be used by its owner as a weapon to force the bringing about of this pleasure is a fact that does not seem far-fetched when we compare the " spoiled " infant with one that has not been so indulged.

The normal, intelligent infant very soon may teach himself to use his original reflex-crying for the purpose of summoning the emotional pleasure of being "taken," or of obtaining a bottle of food, or inducing a swinging motion in the air of this world to which he has so recently come.

Thus is he made ready for life in the era that we ourselves call the " jazz age "—an era, which, particularly in the cities, is shown to be characterized by an increase in mental and nervous diseases among people of all ages, but most marked among children.

Possibly, with this very sketchy preliminary background we may consider the application of our knowledge to habit formation in the new-born, and its particular significance as applied to bad habits in both the infants and their parents.

The Infant's Habits

At no time of life is it more important to guide and correct the formation of habits than in very early infancy. It is just as easy, within reasonable limits, to have an infant develop proper and regular habits in the matter of taking nourishment, sleeping and playing as it is to develop irregularity of appetite, disturbed and erratic slumber and bad temper. When a normal, healthy infant develops bad habits it is not because he has an instinct toward being bad, but

because some mother or some nurse has gone to the trouble of teaching him how to misbehave. From the very beginning the child should be put to the mother's breast at regular intervals, whether it be day or night. He must be fed by the clock; and when he is sleeping at feeding time he should be awakened. The length of time which he is to be at the breast is usually indicated by the attending physician, and this should not be deviated from except for some good reason.

In the matter of sleep, the baby should be placed in his crib at the time indicated, and left to his own devices. If he cries to be taken up or to be rocked, it usually means that on a previous occasion someone had taken him up, or someone had rocked him in order to induce him to go to sleep, and the memory of this pleasurable experience has remained.

A certain amount of crying each day, of course, is necessary, for the young infant has to have exercise, and he will usually indulge in this amount of crying without being taught to do so.

Allowing the baby to get what he wants by crying is teaching him to use his voice as a weapon. Of course, babies sometimes cry from pain, or from colic, but the remedy for even one of these conditions does not consist in rocking and walking with his young lordship.

Often the mother will say, " I know there must be something the matter with my baby or he would not cry that way." It is quite true that the baby may not be normal and may be crying because of the colic or indigestion, or for some other reason. Usually some symptom of the condition other than crying will be observed, such as undigested stools, eructation of gas, or something similar. The physician is often called upon to decide this question. Petting or humoring the baby will not cure the cause of his pain. It is perhaps easier to

inculcate improper habits when a child is ill than at any other time.

The Crying Baby

Training the child in this way should begin from the very first day of birth; usually the "nervous" mother who says she cannot bear to hear the baby cry is more concerned about her own "nerves" than the baby's.

Training the infant in the control of the bladder and the bowels should also begin early. One of the best ways to teach a child to understand the unpleasantness of wet and soiled clothing is to keep him as dry as possible. When the baby is quite young an inspection of the diaper at half-hour or hour intervals is a useful routine during the daytime. The employment of waterproof covers for the diaper not only favors irritation of the skin, but also teaches the child to become accustomed to wet clothing. After the child is a couple of months old he may be placed on a small round vessel after each nursing in the daytime, with the idea of teaching him to empty the bladder or the rectum at this time. As most of the child's earlier memories are associated with food, this is best done at feeding time. Many mothers neglect this practice because they desire the baby to go to sleep while taking the breast or the bottle. It will be just as easy to teach the infant the habit of going to sleep after the exercise I have spoken of as it was to teach him to sleep after feeding. A little patience and a little self-control are necessary on the part of the mother. She will be no less maternal if she follows a strict program. The feeding time, especially if the child receives the mother's milk, affords plenty of opportunity for the necessary mothering of the baby.

Allowing the child to form his own habits of feeding, and

sleeping, and crying, is cruelty to the infant, and eventually to the parents.

The numerous parents who nowadays live in apartment houses are wont to indulge the baby because they fear that his cries will disturb the other occupants of the apartment house. To do this is to borrow a very transient peace at usurious rates of later discomfort. Apartment house life is undoubtedly responsible for much of the " nervousness " of the mothers and also of the children of the present generation. In training the infant the most golden of rules is "Do it now."

The Training of Parents

Among the greatest trials which the infant has to survive after his arrival in this world is the drawback of badly trained parents. Some supposedly amiable fathers and mothers, under pretense of satisfying the baby, satisfy themselves by training him in health-wrecking, character-destroying habits.

There are some people who " cannot bear to hear the poor little dear cry," so they place a nipple or a pacifier in the little one's mouth, so that he may keep his sucking reflex active all the time. If he has had a dilated stomach and has been crying because of it, the additional air which he sucks in will, in the long run, make him more uncomfortable than he was before. After a while he will have acquired the habit of sucking continuously, his palate will grow shallow, his upper jaw narrow, the congestion of his throat will cause an enlargement of the adenoid tissue, and meanwhile he will probably have had numerous throat infections and attacks of sore mouth, or attacks of thrush—all because father or mother could not bear to " see or hear him cry."

Of course, as to " walking " and " rocking " the baby to sleep, the punishment fits the crime. It is very easy to induce

this habit, but difficult to break it once it has begun. This is especially true when, as often happens, the baby begins to sleep all day long in preparation for the fun he will have at night with his parents. Parents who teach the infant to expect such amusements of them need not consult a physician as to reasons why the baby does not sleep at night. They themselves are the reasons.

Then there is the young husband who insists that the baby must be kept awake until he returns at night and has dinner, and then has a romp or a play with his heir. This, of course, may make the baby's bedtime a variable hour, always preceded by a very exciting and nerve-stimulating time. It is amusing to the father—but it doesn't help the infant to sleep soundly, or develop a good nervous system.

Another pest of infancy is the type of grandmother who has reared, or perhaps buried, a large family. It is she who considers it a " perfect outrage " to awaken the baby in order to feed him, or she may imagine that the mother is looking poorly, and proceed to remark that she reared all *her* children on condensed milk, and that all of them were fatter than this particular grandchild.

Another enemy of the child is the mother who proudly tells her friends what the less-than-a-month-old infant *will* not do. " He *will* not take a drop of water," she says, " he spits it right out." A new-born child with a will! The absurd idea that the infant must determine what it should and should not do seems to obsess some of these mothers, and no infant more than a day old is considered incapable of exercising tyranny over his parents.

The young mother who regards her child as a toy—a glorified lapdog or kitten—is also, unfortunately, not unknown. The infant, after all, is just like a weak little plant,

transplanted into strange soil, and needs to be left lie quietly and trained and fed and watered—just that and no more. No better mothering can be given than these duties of keeping the infant quiet and clean and fed and watered. Pulling him up by the roots to play with him or examine his progress is just as fatal to the success of an infant's growth as it is to that of a plant. Only badly trained parents make toys of their infants.

The "Nervous Mother"

The "nervous mother" is often herself the result of bad training in childhood. Nervous mothers are frequently nervous about trivial things, and complacent about any harmful practices that hurt the baby but save their own "nerves." When an older child has a cold because of needless exposure to a nose or throat infection in the parents, the physician will be informed that the mother is "certain the baby has pneumonia. He seems to have a high fever." At the same time the baby will be found to be toddling around the room—because "he cries if you put him in his crib." Such children have been "spoiled" from birth.

Holding young babies up to strong electric lights to see them blink, taking them for long rides in automobiles, especially in light open machines over dusty roads, and carrying them to motion picture auditoriums—all these barbarisms that have been made possible by our vaunted progress in invention are unspeakably harmful to the development of the infant's nervous system. They are practiced only by parents whose reasoning powers are limited, or who are so selfish that they are are willing to amuse themselves at the expense of their children's welfare. No new-born infant should be "aired" in an automobile. The quantities of fine dust that

gather even in a closed car show what an unsuitable atmosphere the " open road " affords for the new-born infant.

" Many parents still need a good deal of bringing up," said Herbert Hoover in his memorable address at St. Louis. Parents should realize that the joy and privilege of having children must be paid for in a good deal of self-sacrifice on their part. This applies not only to the mother, but also to the father. Taking the baby to wholly unsuitable places because the parents have no one to leave him with; gratifying unwholesome desires of the child because it makes father nervous to hear him cry; carrying him around the room fully dressed when he has fever, because " it's so hard to keep him still "—these are examples of conduct by parents that show their own lack of bringing up. " We are still children," said Count Kayserling, " and that is why we think we are so old."

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CHAPTER XIV

MORTALITY IN THE FIRST MONTH OF LIFE FROM BIRTH INJURIES, CONGENITAL ANOMALIES AND HEMORRHAGE

By JOHN A. FOOTE

It is difficult to obtain accurate statistics concerning the relative frequency of occurrence of birth injuries, congenital anomalies and hemorrhage as causes of early infant mortality. The International List of Causes of Death, to which the Census Bureau conforms, is notable for its omission of many important causes which are generally, if not peculiarly, responsible for infant deaths in the first month after birth. For example, birth injury from forceps is mentioned, but from other causes is ignored. Spontaneous hemorrhage, except umbilical, and sepsis of the new-born, are not spoken of.

The International List of Causes of Death, under "Malformations and Diseases of Early Infancy" (X and XI), reads: 150. Congenital malformations; congenital hydrocephalus; congenital malformation of heart; spina bifida. 151. Congenital debility, icterus and sclerema; premature birth, atrophy, marasmus, inanition. 152. Umbilical hemorrhage; atelectasis; injury by forceps at birth. 153. Lack of care.

Confusion is caused by the fact that many of the titles are symptoms of one or more specific conditions and not primary causes of death. In the classification of causes of deaths in infants during the first month, asphyxia, atelectasis, asthenia, general debility, and paralysis and convulsions are symptoms

commonly found in birth injury, intracranial or intraspinal hemorrhage, and pneumonia of the new-born.

In the 1920 census report, 2145 deaths of children under one month of age out of a total of 62,635 were designated as caused by " unknown or ill defined diseases "—3.5 per cent of the total deaths in the first month of life.

Since our general statistics as now classified are not specific enough, I attempted to compare the causes of death under one month of age at Columbia Hospital, a Class A maternity hospital in the District of Columbia, with figures for the general population of Washington for the year 1922 (Table 1). I was enabled to carry out this purpose through

TABLE 1.—*Infant Deaths Under One Month from Certain Causes in the District of Columbia, 1922, Compared with Columbia Hospital Statistics, 1922*

	District of Columbia, 9,121 Live Births			Columbia Hospital, 1,388 Live Births		
	No. of Death	Per Cent of Total	Rate per 1,000 Births	No. of Deaths	Per Cent of Total	Rate per 1,000 Births
All causes	429	100.0	47	53	100.0	31
Hemorrhage	22	5.1	2.4	11	20.7	7.9
Congenital deformities	33	7.6	3.6	4	7.5	2.8
Birth injuries	29	6.7	3.2	5	9.4	3.6

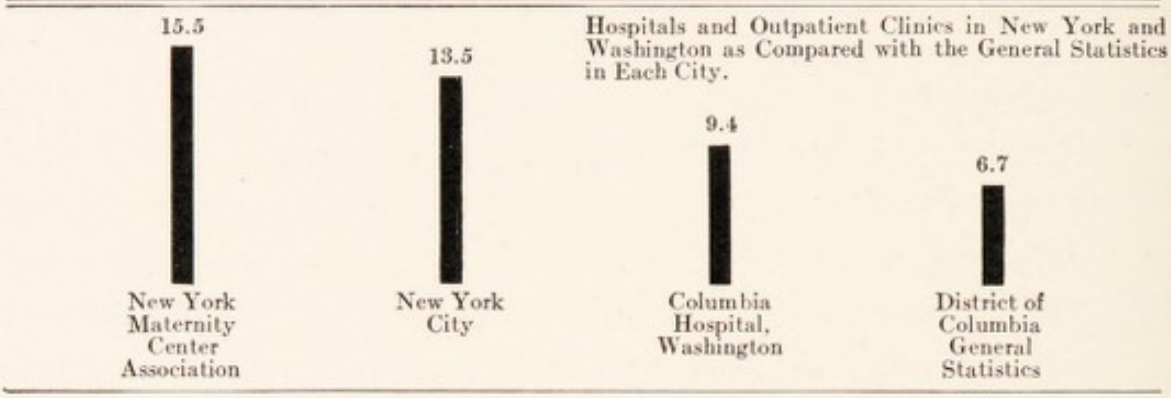
the coöperation of the hospital and of the health department of the District of Columbia. Certain differences stand out between the figures of the hospital and of the community as given in this table.

BIRTH INJURIES

Hospital statistics usually record a higher ratio of birth injuries as a cause of death than the community statistics. Columbia Hospital gives 9.4 per cent of all deaths as due to this, while the community as a whole shows 6.7 per cent. The Maternity Center Association of New York places about half of its mothers in hospitals. The association records 15.5 per

cent of all deaths in the first month (1919–1921) as due to difficult labor, while the general community figures show 13.5 per cent. This is a high rate, and under a stricter classification of causes might be still higher (Table 2).

TABLE 2.—*Deaths from Birth Injuries per Hundred Infants Dying in First Month*

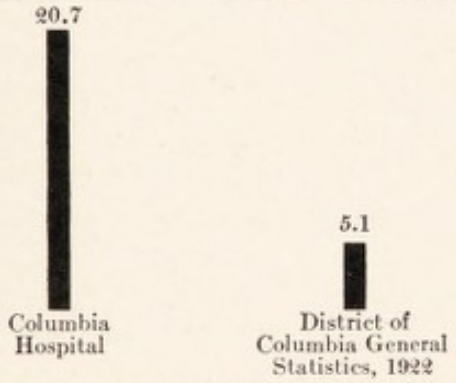


Dr. Louis Dublin, statistician of the Metropolitan Life Insurance Company, being anxious to evaluate benefits derived from prenatal care in the prevention of early infant mortality, studied, comparatively, the figures of the New York Maternity Center Association, and the figures of the general population of New York City. As a result, he found savings in the rates for prematurity, malformation, diarrhœa and enteritis, but not for syphilis, congenital debility, and *birth injuries*. It is interesting to note that Doctor Dublin's findings are relatively almost identical with those in the District of Columbia, being, respectively, 3.2 and 3.6 in Washington, as compared with 4.7 for the general and 4 for the Maternity Center statistics in New York. Prenatal care evidently does not diminish the number of birth injuries. Doctor Dublin says: "The benefits resulting from good prenatal work were lost through the breakdown of the obstetrical service. This accounts for the unsatisfactory results in the rate from dystocia as a factor in early infant mortality."

Hemorrhage

Hemorrhage (*a*) of spontaneous type, or (*b*) due to injury, or (*c*) the perhaps more common type in which both factors are concerned, or (*d*) accompanying asphyxia, is a cause of death the importance of which seems not well recognized. Visible hemorrhage, such as that from the umbilicus, or stomach or bowel is always recognizable; the occult hemorrhage occurring within the cranial cavity may go undiagnosed. But its influence seems to be well understood at Columbia Hospital, for the hospital charges 20.7 per cent of all deaths in the first month to hemorrhage, including intracranial hemorrhage. Contrast this with the figures for the community of 5.1 per cent (Table 3). Hemorrhage, and

Table 3.—*Deaths Charged to Spontaneous and Intracranial Hemorrhage in the General Population, Contrasted with Hospital Statistics of the District of Columbia, 1922*



Constituting in Columbia Hospital 20.7 per cent and in the general population 5.1 per cent of all causes of deaths in infants during the first month of life.

intracranial hemorrhage, especially, seems either to occur, or to be diagnosed, more frequently in the hospital than in the community at large.[1] A fairly large literature has accumulated concerning the hemorrhagic tendency of the new-born as a cause of intracranial hemorrhage, and the treatment of

[1] Warwick, Schwartz, Holland and others have found in routine necropsies evidences of intracranial hemorrhage in from 40 to 60 per cent of all infants born dead or dying during the first month. Cyanosis and atelectasis usually accompany this condition.

this condition by means of hemostatic therapy, since 1918, when I called attention to the relationship between the two conditions. Numerous necropsy records are now available, of which the most recent figures are from Warwick,[2] who found evidence of intracranial hemorrhage in 46 per cent of 136 selected infants dying within the first week of life, although some of these doubtless were small lesions, not capable of causing death. Several other observers have reported from 40 to 60 per cent during the same period. Certain hospitals report intracranial hemorrhage as birth injuries; the incidence, however, under any classification in community or hospital, does not approach the necropsy ratio.

Excepting in the extensive and purely traumatic cases, early diagnosis, and prompt transfusion, or subcutaneous injection of whole blood, should reduce the death rate from intracranial hemorrhage.

Congenital Malformation

Congenital deformities in the general community of the District of Columbia are charged with 7.6 per cent of all deaths within the first month of life, and in Columbia Hospital with 7.5 per cent. In the general community, 66.6 per cent of these malformations are heart lesions, and of one variety only, patent foramen ovale. In the hospital, 50 per cent of fatal malformations are charged to anomalies of the heart, patent foramen ovale being also the only variety mentioned.[3] The figures of the Census Bureau for 1920 charge

[2] Warwick, M., quoted by Ehrenfest, "Birth Injuries of the Child," New York, 1922, p. 45.

[3] Preponderance of congenital heart lesions among congenital anomalies, in general, as compared with hospital statistics, 1922. In general population, District of Columbia, 1922: patent foramen ovale, twenty-one out of thirty-three anomalies. Columbia Hospital, District of Columbia, 1922: patent foramen ovale, two out of four anomalies.

66.6 per cent of 12,229 deaths due to congenital anomalies to congenital heart diseases. This is the same percentage rate as that of the District of Columbia. It would be interesting, if it were possible, to see how many of these were attributed to patent foramen ovale.

We are informed by the statisticians that the death rate from malformations grows less as the community or state acquires age in the registration area, which means experience in collecting and interpreting statistics. The rate varies according to environmental changes even among groups in the same community; thus, in New York City the rate in 1920 was 10 per cent of all deaths in the first year of life, while in infants delivered through the Maternity Center Association it was 6.3 per cent. The etiology of malformations is little understood; but it is believed, despite theories as to injury, infection, amniotic occlusion, etc., that they are in most instances transmitted according to the mendelian laws of heredity, through characteristics inherent in the chromosomes, or at least in the germ plasma. It is difficult, therefore, to accept as accurate statistics which would indicate that environmental changes occurring in the course of a year or so, or even in the same year, could reduce the actual number of the malformations in new-born infants to any considerable degree. It would be more logical to believe that the statistics concerning these deformities, rather than the infants themselves, are changed by improved conditions.

Two alleged facts in the statistical tables seem open to question; that (1) 11.5 per cent of all deaths in the first month of life (which are the figures for the registration area) are due to congenital malformations, and (2) the greater number of these, being fatal anomalies of the heart (100 per

cent in the District of Columbia), are due to patent foramen ovale.

Routine necropsy findings show a much lower rate of occurrence of fatal deformities than 11.5 per cent in the first month or months of life (Table 4). McCrae, at the Montreal

TABLE 4.—*Registration Area Statistics, 1920, and Necropsy Reports on Congenital Deformities*

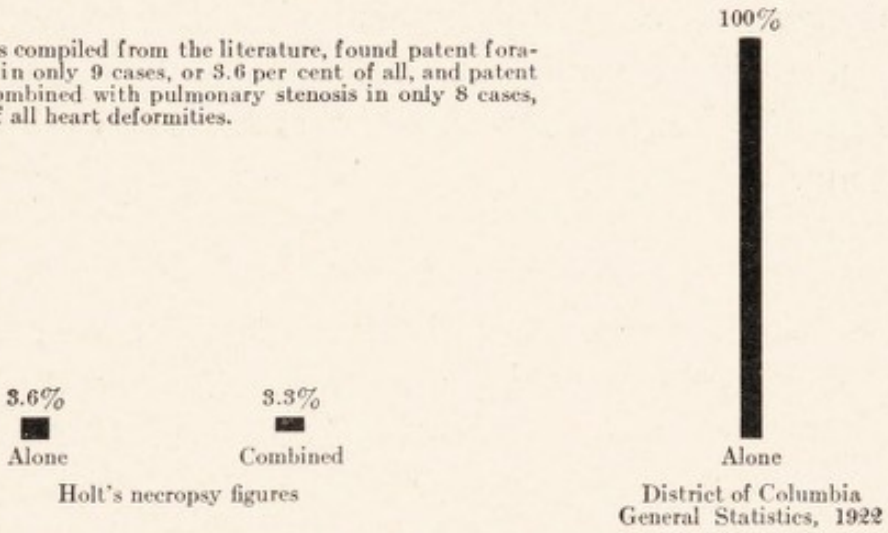
Montreal General Hospital	1 as cause of death in 204 children, all examined at necropsy (78 per cent under 3 months of age). Average, 0.5 per cent of all deaths.	
Sloane Hospital	12 out of 291 deaths (about 50 per cent examined at necropsy). Average, 4.1 per cent of all deaths.	
Census Bureau	Report Registration Area, 1920, 11.6 per cent of all deaths.	

General Hospital, did complete necropsies on 204 children, 87 per cent of whom were under three months of age, and only four children over one year of age. He found a number of anomalies, such as transposition of organs and circulatory defects, but in only one case was the heart lesion the primary cause of death. In all extensive visceral anomalies, cardiac deformities also were found. One child, forty-nine days old, suffering from pulmonary atresia, hypoplasia of the pulmonary ventricle and patent foramen ovale with almost all the viscera transposed, died of pneumonia. Another with transposed viscera, and patency of both septums, died probably of the deformity. Another with multiple heart anomalies, and the liver and gall-bladder transposed, died from pleurisy and lung abscess following pneumonia. Marked patent foramen ovale as a deformity, but not as a cause of death, was found in only two cases out of 204. Only one death in 204 was directly chargeable to a deformity, or about 0.5 per cent. Among 10,000 consecutive births at Sloane Hospital reported by Holt and Babbit, twelve malformations occurred out of

291 deaths, or 4.1 per cent of all deaths. These figures, ranging from 0.5 to 4.1 per cent, would indicate that the general rate of 11.5 per cent among all causes of death in the first month is open to question. Pneumonia, in the Sloane and Montreal General Hospital necropsy series, was, after congenital weakness or prematurity, and accidents of labor, the most frequent cause of death.

TABLE 5.—*Frequency of Patent Foramen Ovale Among Congenital Heart Deformities as Shown in Necropsies*

Holt, in 242 cases compiled from the literature, found patent foramen ovale alone in only 9 cases, or 3.6 per cent of all, and patent foramen ovale combined with pulmonary stenosis in only 8 cases, or 3.3 per cent of all heart deformities.



As to the frequency of occurrence of fatal cardiac malformations as a cause of death, and particularly of patent foramen ovale, as a cause of death, Holt compiled reports of 242 cases of congenital heart disease, and found patent foramen ovale alone in only nine cases, and associated with pulmonary stenosis in only eight cases. This would be a percentage among all cardiac anomalies of patent foramen ovale alone of 3.7 per cent, and complicated, of 3.3 per cent—an extreme variation from the 100 per cent in 1922 in the District of Columbia.

Birnbaum, in the Göttingen obstetric clinic, found four

cases of fatal congenital heart disease among 4200 births. McCullough, Pohlman, Vierordt and many other authorities believe that patency of the foramen ovale, even when marked, is rarely a primary cause of death. Hemenway said recently, " It is in the opinion of the writer very doubtful if patent foramen ovale is ever directly or indirectly a cause of death."

Intermittent cyanosis in infants is probably more frequently due to other causes than to cardiac lesions. It is almost always present in the atypical pneumonia of the newborn and in intracranial hemorrhage. But many diagnoses of congenital heart malformation are made on this symptom alone.

Conclusions

A revision of present methods of classifying the causes of death from diseases peculiar to early life would give more accurate information than is now obtainable.

Better obstetric teaching, which implies larger and better endowed teaching clinics, is necessary if birth injuries are to be minimized. The use of the new-born child for clinical teaching by the department of pediatrics should prevail in every university hospital.

Complete necropsies should be performed on every infant dying within the first month of life.

The frequent occurrence of intracranial hemorrhage, as shown in necropsies, compared with its rarity in other statistical tables, suggests that it is frequently undiagnosed. Prompt diagnosis and use of hemostatic therapy would save many lives.

The rate of congenital heart diseases in general com-

munity statistics, as compared with statistics from necropsies, is much too high. Patent foramen ovale is too frequently given as a cause of death.

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CHAPTER XV

THE PROBLEMS OF PRENATAL, NATAL AND NEONATAL MORTALITY

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CURRENT literature is furnishing constantly increasing evidence of the interest being taken by various agencies: governmental, industrial, social, and philanthropic, in the saving of human life. It is rare, however, in such literature to find the proper biological conception of what human life really is. Life, biologically considered, begins with the fertilization of the ovum and inevitably ends with death. It makes little difference when it is terminated, whether in early fœtal life or advanced old age, the result is the same and does not alter the fact that a new life came into being and for a varying period survived the hazards to which all life is exposed. It is proposed to define here human life as beginning with conception, not with birth, and to consider: first, the appalling loss of life occurring in the prenatal, natal and neonatal periods; second, the causes which operate to produce this loss; and, third, the extent to which it is susceptible of reduction.

The mortality of the neonatal period will be considered first because the available data are much more authentic and reliable for this period than for the natal and prenatal. The neonatal period will be arbitrarily considered as covering the first two weeks of life because this is the average length of time during which the baby is under the care of the physician or midwife in attendance at labor. It is perfectly obvious, how-

ever, that prenatal and natal factors will continue to play an important part in the mortality of the whole first year.

The Fatal Fourteen Days

In the year 1921, the birth-registration area of the United States covered 40.7 per cent of the land area of the country, and had a population of 70,425,705, representing 63.3 per cent of the total population. In this area there were reported 1,714,261 live births, a birth-rate of 24.3 per 1000 of the population. The infant mortality rate (number of deaths of infants under one year of age per 1000 live births) was 75.6. The mortality rate for the first fourteen days of life was 33.6. The rates for the first year from the following causes were as follows: Premature birth, 17.9; congenital malformation, 6.1; congenital debility, 4.4; injuries at birth, 4.2; and syphilis, .9. The total death-rate for these five groups was 33.5. It will thus be seen that whether we attempt to arrive at the infant mortality rate due to prenatal and natal factors by accepting practically all deaths in the first two weeks as so caused, or by taking the mortality rate definitely attributed by the reporting physician to such factors, the result is practically identical, namely, 33.5. Proceeding on this assumption, let us estimate for the population of the United States the annual loss of live-born infants from causes having their basis and origin in the prenatal and natal periods. In the year 1921, the population of the country as a whole was estimated to be 107,833,284. Applying the birth-rate of the birth-registration area, 24.3, to this population there should have been 2,620,348 live births. A mortality rate among these infants of 33.5 per 1000 live births from prenatal and natal causes would mean the loss of 87,781 babies.

Over a Hundred Thousand Stillbirths

When it comes to estimating the loss of infant life attending birth itself anything like statistical accuracy is impossible. The first question to be answered is, what is the proportion of stillbirths to live births; and the second, what proportion of stillbirths is due to natal instead of prenatal causes? The only extensive statistics on stillbirths are those of the birth-registration area (exclusive of Massachusetts, Rhode Island, Washington, and Baltimore, Maryland) for the year 1918. There were reported in this year a total of 48,634 such births. The stillbirth rate per 100 live births, in legitimate births, was 3.9. For the white and colored races the rate was 3.7 and 7.5, respectively. In this connection it is interesting to note that in the state of Maryland exclusive of the city of Baltimore for the same year the rate was 8.6. This high rate was undoubtedly due to an intensive campaign conducted among the physicians to insure the reporting of all such births. This leads to the conclusion that if all stillbirths were reported, the true rate for the birth-registration area would be found to be appreciably higher than 3.9. In France 4.7 is the accepted rate. Cragin, at the Sloane Hospital, had a stillbirth rate of 4.7 in 9769 births, premature and at term, but exclusive of abortions. In view of these figures, it seems proper to accept the estimate of Bacon of a stillbirth rate of 50 per 1000 live births for the United States as a whole, as being eminently conservative. Applying this rate to the estimated number of births for the year 1921 we find the probable number of stillbirths to have been 131,000.

The question of the relative proportions of stillbirths due to prenatal and natal causes is difficult to answer. Bacon states that from one-half to three-fifths are due to natal causes. As yet no vital statistics are available showing the

proportion of stillbirths due to different reported causes. Edgar in a study of the etiology of 500 stillbirths found 120 due to obstructed, precipitate or protracted labor, 65 to cord conditions and 47 due to placental pathology, prævia, premature separation, etc. In 149 cases the cause was unknown. It is probable that we will not be far from the truth if we assume that approximately one-half of all stillbirths are due to the accidents and complications of labor. If this be true it means the annual loss of about 65,500 infants from purely natal causes.

Abortions About One-third of all Births

Since the term stillbirth is defined as the birth after the seventh month of gestation of a child showing no single evidence of life after complete extrusion from the body of the mother, it becomes necessary to consider now the loss of fœtal life caused by the termination of pregnancy prior to the seventh month. At this point we find ourselves entirely in the realm of conjecture. Beitler quotes Pearson's essay on "The Chances of Death" to the effect that the fetal death-rate per 1000 live births amounts to 391 in the first three months, 131 in the second three months, and 83 in the third three months of pregnancy, a total fetal mortality rate of 605. He also quotes Mall to the effect that the fetal death-rate is 500 per 1000 live births. Taussig estimates one abortion for every 2.3 pregnancies. I think we will be well within the facts if we accept the proportion that one pregnancy in three terminates in abortion prior to the period of viability, a fetal mortality rate of approximately 500 per 1000 live births from this cause. If correct, this means the annual loss for the United States of over 1,300,000 potential lives. Summarized, these figures indicate a mortality rate from prenatal, natal and

neonatal causes of 583.5 per 1000 live births and an aggregate loss of life of over 1,400,000.

The Induced and Criminal Abortions

Turning now to the causes for this staggering loss of human life, staggering even if it be regarded as potential only, we must first consider the question of abortion. If it be true that there occur annually in the neighborhood of 1,300,000 abortions it becomes of more than passing interest to know what proportion of these are self-induced or the result of criminal interference. Taussig estimates that more than one-fourth of all abortions are induced. The truth in this matter is very difficult to arrive at. But if we cut Taussig's estimate in half we must still conclude that more than 162,000 fœtuses are murdered annually. In any event the consensus seems to be that this crime is on the increase in all strata of society. The remedy hardly lies in the hands of the medical profession, the great bulk of whom scorn to soil their hands with the blood of these innocents. An intensive campaign through the police power of the state, against the miscreants who engage in this nefarious business might have some beneficial effect—how much is dubious. The crime is too secret and, even when resulting in the death of the mother, too zealously guarded. That the solution will eventually be found there can be no doubt, but one feels that it will lie in the ultimate evolution of the moral, social, and economic fabric of our civilization.

This is not the place to enter into any detailed discussion of the etiology of spontaneous abortion. Mall has pointed out that in many cases these are due to malformations of the ovum and in the present state of our knowledge regarding the causation of such conditions it is altogether desirable that such abortions should take place. In general it is undoubtedly

true that the abortion rate will decrease with any marked increase in the general health and vigor of the population. The rate will also certainly decline proportionately with any decline in the morbidity rate from venereal disease. Any increase in the general level of obstetrical skill available for women at the time of labor, by insuring less traumatized and less infected reproductive organs, will necessarily mean a further decline. Anything like a general education of the prospective fathers and mothers of the race, frankly, openly and fully, in the physiology of sex, and the duties and the responsibility of marriage could not fail to have a beneficial effect. Education of the public, through the medical profession and lay journals, in the advantages and importance of prenatal care in early as well as late pregnancy and the increase of agencies to provide such care for the poor and uneducated would undoubtedly be helpful.

Results of Syphilis and Toxæmia

We have assumed that the combined mortality rate from stillbirths and deaths in the neonatal period of the first two weeks amounts to about 83 per 1000 live births. For the purposes of the present discussion this mortality is divisible into two groups irrespective of whether death occurs *in utero,* during labor, or in the neonatal period. One group contains the deaths due to the accidents and traumatisms of labor, while the other embraces deaths from all other causes. It is true that it is difficult to draw a sharp line of demarcation between the two. Obviously, factors tending to decrease the vigor of the child tend to make it succumb more readily to the dangers of labor itself, and conversely non-lethal traumatism during labor will lower resistance to the dangers surrounding the new-born or accentuate and intensify the

effects of congenital debility carried over from the prenatal period.

Considering briefly the non-traumatic group we find the conditions more frequently responsible to be syphilis, toxæmia, prematurity, congenital malformation, and placental hemorrhage. One glance suffices to show the large degree to which a mortality from such causes is susceptible to marked improvement under intelligent and painstaking prenatal care. Early diagnosis of syphilis and toxæmia and their appropriate early treatment would, undoubtedly, markedly and favorably effect the number of premature births, both live and still, and the mortality of the early neonatal period. In the matter of malformation alone does adequate prenatal care hold out no hope of improvement. In this group a large number of deaths in all series of statistics is assigned to unknown causes, but there is no reason to believe that the future will not ultimately illuminate this darkness and furnish us ways and means of some prophylaxis.

Birth Accidents and Trauma Increasing?

There are some very interesting considerations to be discussed in connection with the group of cases due to birth accidents and traumatisms. We have seen that it is estimated that one-half of all stillbirths are due to natal causes, and there can be no doubt that such factors play an important rôle in the mortality of the neonatal period, probably a much more important rôle than would be indicated by the rate of 4.2 per 1000 live births furnished by the statistics of the birth-registration area for 1921. Bailey found that about 35 per cent of the combined stillbirths and neonatal mortality at the Berwind Maternity Clinic were due to this cause, and in 705 stillbirths and neonatal deaths Williams found 17.6 per cent

due to dystocia. If, in this series, we add to these cases the deaths due to placenta prævia, ablatio placenta, cord infection, strangulation by loops of cord, and cerebral hemorrhage following spontaneous labor, the rate would become 24.3 per cent. Mary Lee Edwards' statistics showed a stillbirth and neonatal loss of 215 cases in 3416 deliveries, and 43 per cent of these were attributed to dystocia and the accidents of labor. It will thus be seen that it is impossible to overestimate the importance of labor itself in the causation of fetal and neonatal deaths. In this connection there is one very significant observation to be made. The rate for deaths of infants attributed to birth injury has been steadily climbing upward over a considerable period of years. The vital statistics reports of the United States Census Bureau show a rate of 6.1 per 100,000 of population for 1906, 6.9 for 1910, 8.1 for 1913, and in 1921, the last year for which figures are available, 10.1, the deaths of 8986 infants having been returned as due to this cause. Is it not pertinent to ask ourselves the question: To what extent is the increasing tendency towards interference with labor, advocated all too frequently in high quarters, responsible for this increase?

A Life-saving Educational Campaign

It might be germaine to call attention to the fact that this rate of 10.1 exceeds the total homicidal rate for the same year, which was 8.5. It would seem to be only necessary to point out that these deaths can be very greatly reduced by the intelligent, conscientious, skilful and conservative conduct of labor, and by the provision of agencies to make services of this type increasingly available not only for the women of the poor but for women willing and able to pay a moderate fee for obstetrical services.

This brings us to the conclusion. We have seen that in the United States there is a probable annual loss of fœtal life from abortion of 1,300,000, a very large proportion of which is criminal; 131,000 stillbirths; and 87,000 deaths of infants in the neonatal period from causes of a prenatal and natal character. Are these not astounding figures? Can anyone point out another field in which the combined labors of the clergy, physicians, lawyers, lay-teachers, medical educators and philanthropists of the country may result in so rich a harvest of innocent lives saved to the country and to posterity?

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