

THE AMERICAN JOURNAL OF ORTHOPSYCHIATRY

VOL. III

JANUARY, 1933

No. 1

BIRTH LESION AS A CATEGORY OF MENTAL DEFICIENCY*

EDGAR A. DOLL, Ph.D.

Director of Research, The Training School at Vineland, New Jersey

CHILDREN who are crippled from birth usually show conspicuous symptoms of mental and motor handicaps, yet professional and scientific interest in such patients has developed very slowly. For many years it was erroneously supposed that birth lesions were due to lack of care or skill on the part of the attending physician. Recent work shows that lesions may be present in the child before birth, that the child may be constitutionally predisposed to birth injuries, and that childbirth presents many hazards quite beyond the reach of preventive obstetrical skill. The early work of the neurologists has been extended and elaborated by obstetricians with illuminating results (2).

About a hundred years ago Dennis, Billard and Cruvilhier published a series of papers suggesting the causal relation between intracranial hemorrhage at birth and the later development of cerebral spastic paralysis. The work of W. J. Little in 1843 focussed further attention on this condition, which subsequently became commonly known as "Little's Disease." It is interesting that in this early paper Little described the condition as a generalized spasticity of the entire voluntary musculature and suggested that it was caused by imperfect cerebral myelination.

It is impracticable here to review the work of previous investigators. The condition is generally referred to as Little's Disease, congenital spastic paralysis, infantile palsy, birth injury, and like expressions. The most satisfactory general term that we can adopt for present purposes is the term "intracranial birth lesions" in place of the more common term, "birth injury."

It is important at the outset to recognize that the child at birth may sustain various types of damage to the central nervous sys-

* To be presented at the 1933 meeting of the American Orthopsychiatric Association.

tem. Probably the majority of these damages are intracranial hemorrhages as a result of birth trauma, that is, of mechanical damage due to interplay of physical forces involved in or produced by the actual process of labor. It is important to recognize, however, that there are other types of intracranial lesions present at birth than those caused by birth. These include infectious diseases, intra-uterine complications, weakness of cerebral blood vessels, imperfect myelination, and other conditions which menace the integrity of the encephalon.

Our concern in this paper is not so much a consideration of the pathology and etiology of birth lesions as the recognition of these cases from the point of view of clinical psychology. These patients have received almost no attention from psychologists because the obvious orthopedic condition has heretofore overshadowed the psychological features. Little (3) called attention to the mental consequences of birth lesions and Tredgold (8) describes the condition as a cause of mental deficiency. Smith (7), Schroeder (6), Lord (4), and others, have called attention to different aspects of this condition, but a complete description as a category of mental deficiency is still to be accomplished.

Five years ago, the Vineland Laboratory attempted to develop more precise pictures of the clinical categories of mental deficiency. Among these, our attention was attracted to the problem of birth injury. This work led to collaboration with Dr. Winthrop M. Phelps, Professor of Orthopedic Surgery at the Yale University School of Medicine, who has made the physical examinations of our patients at semi-annual clinics. A program of muscle training has been carried on with certain cases under the supervision of Mrs. Caroline M. Brown, Head of the Physical Therapy Department at the New Haven Hospital. The immediate psychological aspects of the work during these years was conducted by Miss Ruth T. Melcher. The later work, and especially the motion picture studies, has been done with the assistance of Miss S. Geraldine Longwell.

These early studies immediately revealed that birth injury as a category of mental deficiency is much more common than we had previously supposed. This is, perhaps, not surprising since this condition has not previously been recognized as a distinct category.

In view of Dr. Phelps' orthopedic interests, our attention natu-

rally concentrated in the beginning on those patients with marked motor symptoms, involving especially spasticity and athetosis. Our present research interest is pointing in the direction of pathological idiocy due to birth lesions but without conspicuous motor symptoms. Other investigators have called attention to the effect of birth lesions on the development of personality and behavior, but our material does not lend itself favorably to successful studies in that direction.

As our work developed, we found it necessary to emphasize the general features presented by these children. We also began treatment on a group of twelve subjects by physical therapy methods, especially muscle training. Our interest thus became descriptive rather than diagnostic, with the added problem of measuring improvement from muscle training. At the close of that investigation, a report of which has been published in book form (1), we found ourselves hesitating to formulate the precise clinical features of birth injury as a category of mental deficiency because of uncertainties of classification. We still feel unequal to this task, but perhaps our work has advanced to the point where we are justified in presenting it for the consideration of others whose resources may be better than ours for further clarification of this problem.

At the present time we have under consideration a group of about 40 cases of this type in an immediate total population of approximately 450 feeble-minded subjects of both sexes, all grades, and most clinical varieties. This is approximately 10 per cent of the total group and corresponds closely with the figures obtained by Larsen (9) in a similar and more extensive study.

These cases have been tentatively grouped as "definite birth injury," "probable birth injury" and "possible birth injury," according to the degree of plausibility from the point of view of total clinical impression. No emphasis is to be laid at present on this classification, or even on these total figures, as this work is still too much in its infancy to permit positive conclusions. Moreover, we find ourselves shifting cases into or out of groups as better knowledge regarding them is obtained.

Literally, any case of feeble-mindedness might be considered as possibly due to birth lesion when one considers the whole process of fetal development and the difficulties of childbirth. These possibilities are greatly increased among first births as com-

pared with later births, and are very greatly increased among premature births as compared with full-term deliveries. However, the diagnosis is not to be based on these remote physiological possibilities but rather upon a presumptive likelihood that such possibilities were actually operative in particular cases. The diagnosis should therefore be expressed in terms of more or less likelihood. However, when a case is finally classified as being possibly due to birth injury, this possibility may itself be expressed in relative terms according to presence and absence of positive and negative evidence. Thus, our impression that a case is "possibly" birth-injured means a rather high degree of probability. When this possibility is increased because of more positive birth history and negative other history, the case may be listed as "probably" birth-injured or "definitely" birth-injured, these terms representing increasing degrees of probability. It is usually impossible to diagnose any case as absolutely due to birth lesion because of the difficulties of obtaining absolute proof.

The classification of these cases, therefore, must be considered tentative rather than final. The diagnosis is based on a clinical consideration of the symptomatic features supplemented by an evaluation of the history.

To be included in any of the three groups of "possibly," "probably," or "definitely" birth-injured, significant clinical symptoms must be present as a first condition. In supplementing the clinical symptoms by a consideration of the previous history, we require for positive diagnosis that the birth and developmental history be positive for birth lesions and also that heredity and other pathology be negative. Obviously, in many cases, it is not possible to obtain adequate histories. In other cases the history data are ambiguous, conflicting, or not subject to satisfactory interpretation.

In a complete diagnosis of these cases, therefore, we include six groups of data as follows: (1) clinical status; (2) birth and pre-natal history; (3) neo-natal history; (4) genetic or developmental history; (5) history of pathology other than that associated with birth lesions; (6) heredity.

Before relating how these different elements are combined for a total diagnosis, it may be well to enumerate the details to be considered under each heading. As noted above, we have been concerned only with presumably feeble-minded cases whose mental

deficiency is associated with definite motor handicaps of congenital intracranial origin.

1. *Status*. The most conspicuous features in our subjects are spasticity and athetosis. For present purposes spasticity may be defined as essentially simultaneous contractions of antagonistic or reciprocal muscle groups, accompanied by a marked degree of hypertonicity. Athetosis represents successive involuntary contractions of muscle groups, superimposed upon and interfering with fairly well coordinated voluntary movement (5).

Mental retardation is by no means an indispensable symptom of birth injury but must always be considered as a possible symptom. Satisfactory data are not available regarding the frequency with which this condition results in mental retardation. In a consideration of fifty consecutive cases of cerebral accidents in childhood, Smith (7), finds three-fourths of the cases mentally deficient, and one-fourth mentally normal. At the Spalding School in Chicago, in a miscellaneous group of 150 cases of infantile palsy in children of school age, most of which are presumably due to birth lesions, one-third are rated as mentally subnormal and two-thirds as mentally normal.

Care must be taken not to confuse the percentage of birth injury among the feeble-minded in contrast with the percentage of the feeble-minded among the birth-injured. If all birth injuries resulted in feeble-mindedness, they would still account for but a small percentage of all feeble-mindedness.

Birth lesions are often associated with superior intelligence, suggesting that the lesion left the intelligence unaffected except for a possible reduction from still higher levels of mental normality.

It is further to be remembered that the expression of intelligence among the birth-injured is usually greatly interfered with by the neuro-muscular handicaps of speech and movement.

Aside from the motor handicaps in these cases, there is good reason to suppose that birth lesions produce disturbances of personality and behavior which are reflected in excitability, irritability, distractibility and misconduct, with only minor neuro-muscular incoordination, or only vestiges of previous motor handicaps. It is to be remembered that there is a distinct tendency for the birth-injured to improve mentally, physically and dispositionally with increasing age. This fact is to be considered in evaluating the genetic or developmental history in these cases.

2. *Birth and pre-natal history.* In considering the birth and pre-natal history it is necessary to take into account those features of reproduction and delivery which might affect the central nervous system adversely from the point of view of pathology. Thus, the pre-natal history is to be searched for evidence of infectious diseases, as well as for evidence of pre-natal trauma. The pre-natal history may also show evidence of constitutional conditions in the mother from the point of view of anatomy or physiology which might affect the fetus adversely. Thus, the anatomical and physiological conditions surrounding birth, such as pelvic abnormalities and defects or pathology of the reproductive system in general should not be overlooked.

Prematurity especially predisposes toward birth lesions because of the incomplete development of the intracranial circulatory system and of the cranial bones. Thus, while premature birth may be safe from the point of view of delivery, it may be hazardous from the point of view of the child's development. In over-term births the opposite effect is likely to be encountered, that is, the child may have well developed cranial bones and resistant cerebral blood vessels but mere size may so complicate delivery that intracranial damage results.

Similarly, the hazards to first-born children are much greater than those which confront later births. Likewise, the hazards are generally greater when operative procedures are necessary as contrasted with natural spontaneous deliveries. Precipitate labor may produce unfavorable consequences as may protracted labor. An instrumentally assisted birth may, however, produce less damage than protracted manual delivery. The possible deleterious effect of drugs, if used, must also be considered. In instrumental delivery the hazards of high forceps are, of course, much greater than those from low forceps. One must even consider the possibility of damaging the child in the mere act of handling by the physician, nurse, or midwife after delivery.

It is impracticable to catalog all the details. The person concerned with the diagnosis must reckon with obstetrical procedures, and the interpretation of the evidence must be left to the medical authority. The clinical psychologist, if taking the history in the absence of the physician, will do well to investigate as far as may be reasonably practicable all aspects of the prenatal and natal history which might bear on the case from the point of view

of any extreme or pathological deviation from normal expectation. Such information will guide him in referring the case for medical diagnosis.

More important than the consideration of whether reproduction and birth *might* have caused a birth lesion is careful consideration of the evidence as to whether or not it actually did so. Consequently, the evaluation of the birth and prenatal history must be made in relation to the evidence from other sources. The birth history is to be looked to for a presumptive explanation of the actual condition in the developing child and with reference to the presence or absence of other pathology or unfavorable ancestry.

3. *Neo-natal condition.* In considering whether or not pre-natal conditions or the processes of birth might have produced an intracranial lesion, we must be concerned with the condition of the infant at birth. In most cases of birth injury, if an adequate history is available, there will be definite evidence of the presence or absence of intracranial damage, deficiency, or defect. This evidence may be present at the time of birth or may appear early in the first year of life. The neo-natal evidence may be available in the direct consequences of intracranial damage.

All extremes of behavior are to be viewed with suspicion. Of these, the most common is deficient animation or asphyxia neonatorum of such degree as to require artificial respiration or resuscitation methods. There may be excessive crying or alarming lack of crying. Apathy, extreme restlessness, difficulty of swallowing, retraction of the head, and so on, are important signs. The graver neuro-muscular symptoms include convulsions, muscular twitchings, opisthotonos and actual paralysis, either local or general.

Physically the child may show evidence of contusions, lacerations, hydrocephalus, bulging fontanelles, cranial abnormalities, or marked visual defects, such as nystagmus.

There may be evidence of increased intracranial pressure. A spinal puncture, if made, usually reveals evidence of blood in the spinal fluid if the etiology is brain hemorrhage. The reports may show that intravenous injections of adult blood were employed to check hemorrhages.

4. *Genetic or developmental history.* The symptoms immediately following birth may be apparent in gross delay in development or abnormalities of behavior suggesting grave defects of cerebral

origin in the early expression of inherited neurone patterns. In considering the developmental history it is important to bear in mind that these early symptoms may rapidly be outgrown and may disappear, leaving only vestiges suggesting birth injury as a possibility.

Birth lesions are not progressive after the first few days. Their effects may appear to be progressive, however, from the point of view of disappointed expectation of normal infant development. Thus, the developmental sequences of infancy may be gravely retarded beyond the limits traditionally expected among the ordinary feeble-minded, and this retardation is especially noticeable in neuro-muscular activities. While there may be some doubt as to how seriously the ordinary feeble-minded are retarded in their early developmental behavior, such retardation among the birth-injured feeble-minded is especially common. This is expressed in delayed development of such motor acts as holding up the head, sitting, standing, walking and talking and with correlative retardation in self-control, in self-help and self-expression. Consequently, serious developmental retardation in motor sequences may reveal motor handicaps as such instead of being mere symptoms of intellectual retardation.

The genetic history is also important in those cases where the clinical status at the time of examination may be vague or only suspicious. Recognizing the distinct tendency toward improvement in these cases, the evidence for birth injury may gradually disappear as the child grows out of the early ages.

The developmental history is also important in interpreting the possible influence of post-natal pathology, since the date of such pathology is necessary to the interpretation of its probable effect in producing a clinical status resembling that due to birth lesions.

5. *Pathological history.* The clinical status of the subject for a diagnosis of birth lesion is presumed to include only those symptoms which are of intracranial origin. In evaluating that status it is important to review the history of the patient from the point of view of pathology other than birth lesion which might have produced the symptoms in question. Therefore, before an impression of birth lesion can be reached, it is necessary to eliminate the possibility of intracranial damage as a result of post-natal trauma or disease.

Among these possibilities the diseases which may produce encephalitis are particularly important. Thus, whooping cough, scarlet fever, influenza, and other febrile diseases may, under extreme conditions, produce serious cerebral damage. Epidemic encephalitis, Wilson's disease, and a number of other diseases of the central nervous system, while relatively uncommon may have to be thought of in the particular patient under consideration. Consequently, evidence of any pathology in the history must be carefully evaluated in point of time and severity as well as its nature. Such pathology may be present in a child with birth lesion, acting (1) as an aggravating or predisposing cause; (2) as an independent cause; or (3) as a possible rather than a probable cause of the condition. Thus, the presence of the febrile diseases or other untoward diseases of childhood is sufficiently common among all children to be found often among the birth-injured, without having any direct bearing on the clinical status.

It is this presence or absence of other pathology which makes it so difficult to determine whether the condition of the child in question is or is not probably due to birth lesion. Moreover, one must always reckon with the possibility of an obscure pathology which is either unrecognized or unrecorded. From the point of view of such unrecognized possibilities it is never possible to diagnose any case as more than possibly due to birth injury. However, the total consideration of the patient from all angles does, in fact, permit various degrees of conviction as to the degree of probability.

6. *Heredity.* The presence or absence of unfavorable heredity in cases suspected of birth lesion has, of course, a direct bearing in relation to the mental condition of the patient and must be reckoned with in some degree with reference to the motor symptoms. Thus, in cases of mental deficiency without motor symptoms, which are attributed to birth lesions because of positive birth histories and negative other pathology, heredity is of prime importance. With the mechanism of hereditary feeble-mindedness being questioned with reference to the Mendelian type of transmission, the evaluation of hereditary influences is uncertain. Broadly speaking, aside from the mental factor among the birth-injured feeble-minded, heredity is relatively unimportant, although Tredgold (8) takes the opposite position in respect to neuropathic ancestry. There is, of course, no reason why a feeble-

mind mother is immune to the hazards of reproduction and delivery and therefore incapable of producing a child with birth lesion. Consequently, even if the heredity is unfavorable, this does not rule out the possibility of birth injury.

In combining the several aspects of the clinical examination it will readily be evident that the adequate diagnosis of the case calls for cooperation on the part of several specialists. The condition being primarily pathological, it is to be expected that the physical diagnosis and the corresponding evaluation of history data should be made by competent medical authority. Since the condition includes psychiatric, obstetrical, orthopedic and neurological aspects, the collaboration of several medical specialists may be advisable. Certainly, the principal diagnosis should be made on medical authority and this requires that the physician in question have experience with patients of this type.

The contribution of the psychologist is significant from the point of view of the mental features of the clinical status, such as the adequate determination of intellectual level, personality deviations, psychomotor skills, educational achievement and genetic development of behavior. It is important that the mental and physical features be evaluated correlatively, since the expressive behavior of the individual is gravely affected by his physical condition.

This condition, therefore, requires that ideal cooperation between psychologist and physician, the lack of which has heretofore led to such unfortunate controversies and disappointments in both fields. Since the condition involves a pathology of constitutional origin it would certainly be unwise for the psychologist to attempt independently to make a diagnosis. Moreover, it should be reiterated that a positive diagnosis is difficult even under the most favorable circumstances since only certain degrees of probability in terms of clinical impression can be reached.

This arriving at a conclusion in a given case involves a well-balanced consideration of all the principal features mentioned above. It is practically impossible to evaluate these features separately and so obtain an additive diagnosis. The diagnostician must evaluate the evidence from each field in the light of the evidence from other fields on a kind of shuttle system of diagnosis. The skilled experience of the examiner will count heavily, since there are many features present which cannot as yet be adequately

formulated but must be left to the impression produced by a comparison of cases presenting both similar and dissimilar types of evidence.

Our group of cases includes only those whose clinical status and previous history suggest a pronounced likelihood of birth lesion as a cause. The degree of probability in our cases has been further expressed as "possible," "probable," or "definite," according to the relative weight of the different aspects of the symptoms and the history data. Where heredity and post-natal pathology are negative, while birth history, neo-natal condition and developmental history are positive, the case has been considered as "definite" birth lesion (bearing in mind that this reflects only a high degree of probability rather than absolute certainty). Where the history data are more or less in conflict, with the weight of evidence favoring birth lesion rather than post-natal pathology or heredity, the case has been listed as "probable." Where the birth and developmental histories on the one hand and the heredity and post-natal pathology on the other are of equal or uncertain value, the case has been listed as "possible" birth lesion. No case has been listed as "possible" without a fairly high degree of probability that the birth lesion is actually the cause of the condition.

At the present time we are extending our inquiry in the direction of feeble-mindedness without conspicuous motor symptoms. It is already quite clear that the birth lesion might affect the intelligence primarily, leaving the neuro-muscular system entirely unaffected or only slightly affected. This likelihood is increased by the recognized fact that there is a tendency for both the motor and mental symptoms to diminish with increase of age. It should be recognized that such improvement might reduce either the motor symptoms or the mental symptoms independently or jointly. This problem involves especially the consideration of the lower grades of feeble-mindedness where there is always a presumption of pathology rather than heredity.

Our investigation further involves those cases where heredity is negative and post-natal pathology is either negative or highly improbable. This group of cases further includes those feeble-minded individuals whose birth histories and early developmental histories strongly suggest birth injury as a cause of the condition. In other words, in this group of cases the evidence for birth lesion is positive and the evidence for heredity or post-natal

pathology is negative, but the clinical status is also negative with reference to well-defined motor symptoms.

We have thus far tentatively collected a group of six cases listed as possible birth injuries and three cases as probable birth injuries, a total of nine in addition to the above 44 (that is, an additional 2 per cent of the total population group under investigation). These low-grade patients are markedly irritable and distractible with conduct disturbances and personality deviations sufficient to warrant considering them as suspicious cases. The presentation of this evidence, however, is premature since most of these cases have not yet been definitely classified.

In describing birth lesion as a category of mental deficiency, no attempt is made herein to describe or evaluate the methods of clinical psychology from the point of view of mental examination methods. This is a problem of its own and has already been treated in the study referred to (1). It will suffice for present purposes to emphasize that an adequate mental examination of any birth-injured subject presents problems requiring special technique, skill, patience and experience. The handicaps of verbal and motor expression which are the distinguishing earmarks in these subjects gravely increase the difficulties of examination.

The motion picture film to be presented shows two representative cases of mental deficiency with motor symptoms, the first case representing spasticity and the second athetosis. As noted above, spasticity involves simultaneous contraction of antagonistic or reciprocal muscle groups with hypertonicity, while athetosis involves superimposed involuntary contraction in otherwise fairly well coordinated muscle groups. The neuromuscular picture is fairly distinctive. The routine of movements has been developed on a research basis designed to reveal the principal muscle groups as reflected in every-day behavior situations.

BIBLIOGRAPHY

1. DOLL, E. A., PHELPS, W. M. AND MELCHER, R. T. *Mental deficiency due to birth injuries*. New York, Macmillan, 1932. 289 pp.
2. EHRENFEST, HUGO. *Birth injuries of the child*. (Second Edition.) New York, Appleton, 1931. 317 pp.
3. LITTLE, W. J. *On the influence of abnormal parturition, difficult labors, premature birth, asphyxia neonatorum, on the mental and physical condition of the child, especially in relation to deformities*. Transactions of the Obstetrical Society of London 3: 293, 1862.

4. LORD, E. E. *A study of the mental development of children with lesion in the central nervous system*. Gen. Ps. Monog. 7: 365-486, May, 1930.
5. PHELPS, W. M. *Cerebral birth injuries: Their orthopaedic classification and subsequent treatment*. J. Bone & Joint Surg., p. 773, October, 1932.
6. SCHROEDER, PAUL L. *Behavior difficulties in children associated with the results of birth trauma*. J.A.M.A. 92: 100-104, Jan. 12, 1929.
7. SMITH, GROVES B. *Cerebral accidents of childhood and their relationships to mental deficiency*. Proceedings and Addresses of the American Association for the Study of the Feeble-minded 21: 77-98, June, 1926.
8. TREGOLD, A. F. *Mental Deficiency (Amentia)*. (Fifth edition.) New York, Wood, 1929. 535 pp.
9. LARSEN, ERIK J. *A Neurologic-Etiologic Study on 1000 Mental Defectives*. Acta Psychiatrica et Neurologica 6: 37-54, 1931.