

BRACHIAL BIRTH PALSY IN THE NEWBORN.

A REVIEW OF RECENT LITERATURE.

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1. UEBER ENTBINDUNGSLAEHMUNGEN DER OBEREN EXTREMITAETEN BEIM KINDE.—Stransky (*Zentralbl. d. Grenzgeb. d. Med. u. Chir.*, 1902, No. 13).
2. UEBER ENTBINDUNGSLAEHMUNGEN.—Stolper (*Monatsch. f. Geb. u. Gyn.* Bd. XIV, p. 49).
3. THE PATHOGENESIS OF OBSTETRIC PARALYSIS.—Thoyer-Rozat (*L'Obstetrique*, September, 1904).
4. CLAVICULARFRAKTUREN NEUGEBORENER BEI GEBURT IN SCHAEDEL-LAGE.—Hauch (*Zentralbl. f. Gyn.*, 1905, No. 33, p. 1025).
5. OBSTETRIC PARALYSIS.—Bullard (*Am. Jour. of Med. Sciences*, July, 1907, p. 93).
6. BEITRAG ZUR FRAGE DER AETIOLOGIE DER ENTBINDUNGSLAEHMUNGEN DER OBEREN EXTREMITAETEN.—Eversmann (*Arch. f. Gyn.* Bd. 68, p. 142).
7. A STUDY OF BIRTH PALSY.—Clark, Prout, Taylor (*Am. Jour. of Med. Sci.*, October, 1905).
8. OBSTETRICAL PARALYSIS.—Thorburn (*Jour. of Obst. Brit. Emp.*, May, 1903, p. 454).
9. DIAGNOSE SYPHILITISCHER EXTREMITAETSLAEHMUNGEN BEI NEUGEBORENEN.—Lewin (Rev. in *Muenchn. Med. Woch.*, 1902, No. 18, p. 761).
10. Kennedy (*Brit. Med. J.*, February 7, 1903, p. 298).
11. RESULTS FROM THE SURGICAL TREATMENT OF BRACHIAL BIRTH PALSY.—Taylor (*Jour. Am. Med. Assn.*, Jan. 12, 1907, p. 96).

Statistics quoted in many of the modern textbooks of obstetrics place the frequency of brachial birth palsy as approximately one case in 2000 deliveries. Of late, quite generally, the belief is gaining ground that this percentage is too low, because this figure undoubtedly is based upon statistics made in maternity hospitals in which, as a rule, all cases are handled by skilled men, and this factor, as will be shown, materially reduces the number of palsies. But there are many other reasons which preclude the collection of exact statistics. Stillborn babies, obviously, must be excluded from the calculations; light forms of palsy are very often overlooked, and certainly very often not recorded because they recovered promptly. There can not be any doubt that in many of these cases a false diagnosis of fracture or dislocation is made, or a dislocation mistaken for a palsy. Indeed, only of late, with the more general use of the x ray for diagnostic purposes, has it been possible to make a positive diagnosis in obscure cases. It is certainly a noteworthy fact that simultaneously with the improvement in our diagnostic methods and of

our knowledge concerning the etiology of this disease, the belief is steadily growing that brachial birth palsy, while not as common as facial palsy, is a condition not by any means rare in the newborn.

The increased interest in this unfortunate birth injury, manifest in the great number of important contributions on the subject, has evolved two very practical results; firstly, the successful repair of the injury by operation in certain cases, and, secondly, the recognition of the fact that this palsy, in the large majority of cases, is due to improper manipulations on the part of midwife or physician during delivery. That such manipulations might be responsible for this paralysis was suspected for a long time, and finally practically proved so by Prouff and Guillemot (*Ann. de Gyn.*, January, 1897), who reported an *endemie* of thirty cases of brachial palsy in the practice of a single midwife. The appreciation of this fact lead to investigations concerning the cause of this condition and as a result of this labor many theories were advanced. Most of these are detailed in the two very exhaustive papers on this subject which have recently appeared: a collective abstract of Stransky (1), including 90 articles and quoting the histories of 94 cases recorded in literature up to 1902, and a paper of Stolper (2) in which he describes his own investigations and experiments.

From the latter paper I shall quote some interesting data concerning the gradual evolution of our present views regarding the etiology of brachial palsy.

The first casuistic report of a case of brachial birth palsy was published by Danyan in 1851. A still earlier report of a bilateral brachial paralysis by Smellie is too inaccurate for scientific consideration. The first exact description of this condition was furnished by Duchenne in 1871. He, however, limited his observations to prognosis and therapy, making no reference to etiology. Seeligmueller, in 1874, said the forceps could cause paralysis not only of the facial but also of other nerves,—thus by pressure of this instrument against the brachial plexus a paralysis of the upper extremity could be produced. He called attention to the fact that this form of palsy is more common in breech presentation when strong traction or pressure is exerted against the shoulders. Erb's classic paper, which also appeared in 1874, is based upon observations of brachial palsies in the adult. He found as a cause of the symptom complex, a lesion of the fifth and six cervical nerves, and discovered a spot above the clavicle from which contractions in the paralyzed muscles could be produced by the application of the electrode. It is worthy of mention that in adult patients, contrary to the common findings in the newborn, the *M. infraspinatus*, and the *suprascapularis*, is only rarely found affected. F. Schultze (*Arch. f. Gyn.* Bd. 32, p. 410) in describing a case, supported Erb's theory, and attempted to prove that the lesion is produced by the pressure exerted upon Erb's point by the clavicle when the shoulder is forcibly elevated and the arm thrown upwards and backwards. In his opinion a strong curve of the clavicle and a lack of adipose tissue favor the development of the paralysis.

The next contributor to the question is Thorburn (1886). He observed a paralysis of the left arm, complicated by a ptosis and miosis of the left eye, the child having been extracted with forceps. He explained the symptom complex as due to a trauma of the sixth cervical and first dorsal nerves above the *rami communicantes* which lead to the sympathetic. In his opinion, the injury is not a simple compression, but an actual tearing of the nerves, the result of hyperextension of the shoulder. Chronologically a paper of Burr, not quoted by Stolper, pub-

lished in 1892, must here be mentioned. Burr advanced the theory, which to-day must be regarded as obsolete, that the palsy is due to an injury of the spinal cord.

Fieux, in 1897 (*Ann. de Gyn. et Obst.*, January), although corroborating Erb's theory concerning the etiology of Duchenne's palsy, refused to accept the idea that the trauma to the plexus was caused by pressure against Erb's point, exerted directly by the blade of the forceps, the clavicle, or the finger of the obstetrician. He holds that the injury consists of a rupture of the fifth and sixth cervical nerves, the result of overstretching. In this Fieux agrees with Thorburn, but he offers a different explanation of the immediate cause of the lesion. If traction is made not in an axial direction, but with the head inclined toward one shoulder (what he terms *tractions asymétriques*) these nerves are overstretched and partially or completely torn. Only in this manner, in Fieux's opinion can isolated paralysis of the deltoid be explained; but, of course, one must remember, as has been pointed out by Bollenhagen, that in adult cases, even of typical Duchenne palsy, the functions may have been restored in all the affected muscles except the deltoid.

In 1899 Shoemaker (*Zeitsch. f. Geb. u. Gyn.*, Bd 41) repeated the experiments of Fieux and confirms his conclusions. He thinks, however, that in some cases the typical picture of a Duchenne palsy is produced by simple compression of the nerves by the finger, in Mauriceau's grip in breech cases; by the blade of the forceps, or by the clavicle when traction is exerted on the born head. During forceps extraction this unfortunate complication is more likely to occur if, in occipital presentation, the head is too forcibly flexed; or, in face presentation, if it is too strongly deflexed, especially if at the same time the handles of the instrument are pulled in a direction which forms an angle with the axis of the fetal body.

Kuestner's statements in Mueller's *Handbuch der Geburtshilfe*, for some time influenced the opinion of many writers, but to-day they are irrelevant in view of the radiographic methods of diagnosis, and as the result of the advanced knowledge regarding the etiology of brachial palsy. Kuestner did not deny the possibility of a true brachial palsy due to an isolated injury to the nerve plexus, but was inclined to believe that in the overwhelming majority of these cases the actual cause of the palsy was due to a fracture or dislocation near the shoulder. In vain he tried to explain to himself why facial palsies heal so readily, and the brachial palsies prove so refractory to all kind of treatment, indeed remain permanently unrelieved in a striking percentage of cases. "In the case of the facial paralysis it is always hard steel; in the brachial cases, as a rule, the soft finger of the obstetrician which exerts the injurious pressure against the nerve." Thus he seemed forced to his conclusion that in all serious cases, with a more or less permanent destruction or impairment of function, the trauma to the plexus had been complicated by an unrecognized injury to the humerus or a dislocation.

Stolper (2) observed a typical Duchenne palsy subsequent to the forceps extraction of the fourth child of a woman, whose second child, after a spontaneous delivery, had shown the same condition. After having studied most carefully the entire literature on the subject and repeated the various experiments made by preceding investigators on the cadaver, he was able to confirm some of the older theories and to prove the fallacy of others. He formulates his own opinion in the following deductions: (1) Direct pressure of the forceps can lead to brachial palsy only in cases of deflexed head presentation, if the deflexion is not

recognized or the forceps is not applied in accord with the rules for the deflexed head. (2) Direct pressure of the clavicle may cause paralysis if the arm and with it the clavicle is forcibly pulled upwards and backwards. This condition will arise only during the extraction of breech cases or after version, usually in connection with difficulty in freeing the arm. (3) In cases of head presentation the fifth and sixth cervical nerves may be stretched severely, but never actually torn (as is claimed by Fieux!) in an attempt to pull excessively broad shoulders through the pelvic outlet. This is more likely to occur if the head during the extraction is strongly bent laterally, the palsy then appearing on the other side. It is obvious that a small pelvis or abnormally broad shoulders, as *e. g.*, is stated by Oppenheim (*Lehrbuch der Nervenheilk*, 1898, p. 319), will more often necessitate such a forcible extraction. It is probable that this explains the occurrence of a brachial palsy in two infants of the same mother as in Stolper's case. (4) Hard pulling in cases of deflexed head presentation favors the development of palsy, and, therefore, Stolper advises to avoid carefully both further deflexion and lateral flexion, if difficulty with the shoulders demands traction on the born head. (5) It is obvious that nerve injury may be caused by fractures or dislocations near the shoulder.

In an interesting article Thoyer-Rozat (3) state that to-day it is almost generally accepted that, in accord with Fieux's findings, the elongation and rupture of the roots of the brachial plexus, not simply their compression, are the cause of the brachial palsy. They admit the etiologic importance of asynclitic tractions made in the attempt to free the anterior shoulder from the pubic arch. These writers, however, observed a paralysis produced under conditions which, in their belief, precluded all possibility of elongation or indirect rupture of the roots of the plexus. There was difficulty in the birth of the shoulders. The anterior shoulder became impacted behind the symphysis. The posterior shoulder being more accessible, its arm was disengaged first and brought down. The anterior arm, however, was the one paralyzed, and in this case direct pressure of a finger against Erb's point on the anterior shoulder most probably produced the palsy. For the obstetrician the rule must be derived, to beware of unnecessary asynclitic tractions in cases of impacted shoulders, and at the same time to remember Budin's precept, to carefully avoid pressure on Erb's point.

The conclusions of Stolper's very valuable paper fairly represent the modern views concerning the mechanical cause of brachial palsy. Improper traction on the born head undoubtedly may prove detrimental to the infant; and it seems appropriate to mention in this connection a paper of Hauch (4) in which it is shown that these same asynclitic tractions also may cause fracture of the anterior clavicle lying behind the symphysis.

The common view, especially of neurologists, that brachial palsy is practically limited to cases of breech presentation and instrumental delivery, is untenable. Bullard (5) has investigated a considerable number of cases in the Department of Nervous Diseases at the Children's Hospital at Boston, by sending a request to the attendant physician asking for an account of the delivery and labor. In this manner reports have been obtained of 43 cases. Forceps was used in 28 cases. The head presented in 40 cases, the breech in 3, which certainly represents a strikingly small percentage of breech cases. In 18 cases it was especially noted that the shoulders were held or offered resistance to extraction. On the other hand, it was expressly recorded in 5 cases that the shoulders were not held.

A rather novel suggestion relating to the etiology of brachial palsy is contained in Stransky's paper (1). He lays stress upon the fact that a very large number of these babies undoubtedly are born in an asphyxiated condition. Referring to the generally accepted fact that circulatory disturbances together with toxic conditions play an important rôle in the causation of certain palsies as observed, *e. g.*, in alcoholics, or after a general anesthesia, etc., he suggests that possibly the increased vensity and thus abnormal toxicity of the blood of the asphyxiated newborn, may stand in some relation to birth palsy.

Reference has already been made to the existing dissensus of opinion concerning the exact nature of the injury to the plexus. While Fieux and many others assume an actual tearing of the roots of certain nerves, Stolper and a few insist upon their claim that the injury is limited to the effects of a strong compression. Several recent contributions strengthen the theory of an actual interruption in the continuity of the affected nerves.

In a case of Eversmann (6) a left sided Duchenne palsy developed in a baby extracted after version. Two and one-half months later the baby died with the symptoms of the paralysis unchanged. At the post mortem examination a small tumor was found occupying the fifth cervical nerve, where it received the fibres of the sixth nerve, the tumor including the phrenicus. Microscopic examination established the fact that this tumor was a fibrous callus formed in place of a complete tear of that portion of the nerve.

Clark, Prout and Taylor (7), who operated on a number of these cases and thus gained material for histologic investigations, divided the lesions into immediate and remote. The immediate lesion consists in a tearing of the perineural sheath surrounding and supporting the nerve trunk and the incidental rupture of bloodvessels belonging to it. There is, furthermore, a severance of the nerve strands, more or less complete, depending upon the severity of the case. The remote result is brought about and its extent determined by (a) the healing of the perineural sheath, (b) the organization of the blood clot, and (c) the ultimate contraction of the cicatrix upon the nerve strands, which not only prevents their regeneration but determines a pressure neuritis in those not severed and upon which it may chance to impinge. When pressure alone is the cause of the palsy, there is little pain and spontaneous recovery ensues within a year. When, however, the infant is peevish and irritable, showing signs of pain, tearing has taken place and spontaneous recovery rarely follows.

The character and extent of the injury obviously determines the symptoms in the particular case. Stransky describes the typical picture of a brachial birth palsy as follows: The muscles almost always affected are the deltoides, biceps, brachialis internus, infraspinatus and the supinators, quite frequently involved are latissimus dorsi, teretes and trapezius inferior. The muscles chiefly affected are those supplied by the fifth cervical nerve, to a smaller extent, those controlled by the sixth cervical. In about 13 per cent. of the cases the paralysis is limited to the forearm, implying the muscles of the hand and fingers. In these cases, without exception, oculo-pupillary symptoms (ptosis and miosis, the narrowed pupil, however, reacting promptly to light) are present due to the fact that in these cases the injury extends to the root of the first dorsal nerve which contains the roots of the corresponding sympathetic branch. In contradistinction to lesions of the upper portion of the plexus in these cases the reduction or complete absence of sensibility in the forearm is well

pronounced. In a number of instances the palsy has been seen accompanied by a facial paralysis of the same side.

According to Thorburn (8), in the common form—the Erb-Duchenne type—we deal with a paralysis with loss of faradic reaction and subsequently atrophy of biceps, brachialis anticus, deltoïdes; long and short supinators, teres minor, supra- and infraspinatus. In such cases the shoulder is flaccid, while we find retraction of the eyeball and miosis upon the affected side, from injury to the *rami communicantes* which leave the last cervical and first dorsal roots to join the cervical sympathetic, and thence to pass to the *dilator iridis* and the muscle of Mueller.

Anesthetic areas are not often detected in these cases. In infants anesthesia would readily escape observation, and even in paralysis of the entire plexus it may be difficult to ascertain whether it is or is not present.

As to differential diagnosis, Stransky mentions the following conditions which may produce similar symptoms: Obstetric lesions of the spinal cord, meningeal hemorrhages or other cerebral injuries, and acute infantile poliomyelitis.

From a differential diagnostic point of view, peculiar palsies of the upper extremities are noteworthy which occur in heredo-syphilitic children. Lewin (9) emphasizes the fact that for these cases a peculiar position of the extremities, resembling the fins of a fish (*Flossenstellung*) is absolutely characteristic. The hand is in extreme pronation, its palm looking outwards and backwards, the carpal joint being flexed to a right angle, while the hand is abducted and forms a blunt angle with the ulna.

The treatment of obstetric paralysis of the arm has until recently consisted solely in the use of warmth, massage, galvanism and the like. Thorburn (8) suggested in 1886, arthrodesis at the elbow for certain cases, but in 1905, when he published the paper already quoted, he did not think that this suggestion ever had been carried out. He gives the following data concerning the gradual development of the present surgical methods of treatment of brachial palsy: In a case of rupture of the plexus, due to attempted reduction of a dislocation of the humerus, Wallis (*Trans. Clin. Soc. London*, 1898) successfully resected a mass of nerve callus involving the roots of the plexus. Tuffier performed a similar operation in 1899. Two years previously in a case of complete rupture Thorburn himself had removed, with partial success, a mass of callus involving the entire plexus (*Brit. Med. J.*, May 5, 1900). Oppenheimer quotes a case sutured by Lesser. Kennedy (*Glasgow Med. J.*, October, 1900), also performed successfully the operation of callus resection with secondary suture. There are numerous cases on record of primary suture of the injured brachial plexus.

Kennedy (10) has extended the operation to obstetric paralysis and has reported three cases in all of which the cicatrix was situated at the junction of the fifth and sixth cervical nerves. Kennedy suggests two months after birth as a reasonable period to wait for spontaneous recovery.

Clark, Prout and Taylor, in the article already mentioned, express the opinion that the nature of the lesion in all cases demands excision of the damaged area and stuture of the divided ends as soon as it is proved that spontaneous repair will not take place. The proper time for surgical interference can not yet be definitely stated. It appears, however, to be much later than two or three months after birth, as advised by Kennedy. At the present time one year would seem a reasonable delay before operation.

In a very interesting paper Taylor (11) deals with the results so far obtained with the surgical treatment of brachial birth palsy. His conclusions are based upon observations made on nine patients. As the immediate result of the operation, in seven cases, an increased area of paralysis appeared, due to the necessity of dividing some normal nerve fibers in excising the cicatricial tissue. In all cases the power lost through operation has been regained. As far as remote results are concerned, improvement in the nutrition of the limb is one of the first signs of regeneration in the sutured nerves. It is evidenced by the appearance of more natural warmth and color. This change usually begins about the end of the fourth month. The return of power in the muscles paralyzed by the operation is usually rapid and may be completed in from six to eight months. The return of function in the previously paralyzed muscles appears in from six to ten months. Systematic after treatment (massage, electricity, passive motion, etc.) is very necessary in order to prepare good mechanical conditions for the exercise of nerve power when regeneration occurs. These same means must be employed from a period shortly after birth till either spontaneous cure occurs or operation seems indicated.