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Neonatal Brachial Plexus Palsy and Causation

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A vaginal childbirth is the result of the internal (endogenous) expulsive forces of uterine contractions, usually supplemented by active maternal pushing¹. Depending on the clinical circumstances, additional external (exogenous) traction forces may be required from the birth attendant. This blend of internal and external forces varies from birth to birth. Women who have had a previous vaginal delivery, for example, may deliver successfully with uterine contractions alone and the role of the birth attendant may be simply to control and slow the delivery so that trauma to the maternal perineum from stretching by the fetal head is minimised. In contrast, additional traction may be required by an obstetrician at the time of an operative vaginal delivery for fetal distress or dystocia. The strength of the traction required may be increased by clinical factors, for example, fetal macrosomia or malposition. The traction should be axial in the direction of the birth canal, which is a vector combining horizontal and vertical traction at 25-45 degrees below the horizontal when the woman is in the lithotomy position.

Neonatal Brachial Plexus Palsy (NBPP), is a flaccid paresis of an upper extremity where the passive range of motion is greater than the active². The majority are Erb's palsy involving C5 and 6, but a small minority are Klumpke's involving C8 and T1^{1,2}. A summary of 63 publications in English reported a rate of 1.5 per 1000 births in the United States, compared with 1.3 in all other countries². The first Irish Maternity Indicator System (IMIS) report found that the rate of transient and permanent NBPP nationally was 1.29 (95% CI 1.01 to 1.56) per 1000 births in 2014³. Most NBPPs resolve but about one in ten persist after 12 months and may require surgical intervention^{1,2}. Despite surgery, the palsy may be associated with a permanent neurological disability.

NBPP is strongly associated with shoulder dystocia (SD) which is usually defined as difficulty, despite an attempt at downward axial traction, in delivering the baby's shoulders sufficient to require the use of an obstetric manoeuvre¹. SD is an unpredictable obstetric emergency which complicates 0.2-3.0% of all vaginal deliveries¹. If there is a delay of more than five minutes in delivery, the risk of fetal hypoxia starts to increase which may potentially result in cerebral palsy or perinatal death. The birth attendant, therefore, has to immediately strike a balance between enough traction to deliver the body and avoiding excessive traction that may inadvertently traumatise the brachial plexus. The position of the mother and the direction of traction are also critical to a successful delivery¹.

Apart from clinical considerations, NBPP associated with SD has emerged as an important medicolegal issue. In a five-year review by the State Claims Agency of incidents and claims in the Irish maternity services, the total transactional expenditure in 2014 was €58 million of which cerebral palsy accounted for €47 million⁴. SD accounted for the next highest cost of claims and it is likely that permanent NBBP accounts for most of the claims associated with SD. It should be noted that while 336 cases of SD were notified in 2014, only five claims of SD were created by cost, which was similar to the four previous years and in keeping with the expected rate of permanent NBPP.

Until recently, some obstetricians were of the opinion that the cause of NBPP associated with SD was usually due to excessive downward traction on the fetal head by the midwife or obstetrician in their attempt to expedite delivery quickly, whereas others believed that NBPP could also result from the forces of propulsion^{5,6}. Furthermore, a recent review of the literature found that NBPP was not associated with SD in 46% of cases and occurred occasionally after Caesarean section¹.

Previous understanding of NBPP however, needs to be revised in the light of a Report from the American College of Obstetricians and Gynecologists (ACOG) Taskforce on Neonatal Brachial Plexus Palsy in 2014¹. This authoritative report is unusual because, unlike other ACOG publications, it was written in collaboration with the Society of Obstetricians and Gynaecologists in Canada and has been endorsed by other professional bodies across the world. It is also a multidisciplinary report crafted not only by obstetricians, but also paediatricians and neurologists.

After extensive review of the literature, the section on causation notes that both maternal (endogenous) forces and clinician-applied (exogenous) forces have a direct effect on the fetus as a whole and on its discrete anatomic structures. The occurrence of NBBP is a complex event, dependent not only on the forces applied but also on the constellation of forces (e.g. vector and rate of application), as well as individual fetal characteristics such as birth weight. They concluded that the diagnosis of NBBP does not a priori indicate that excessive exogenous forces were the cause of the injury and that it may occur in circumstances where the standard of intrapartum care was appropriate¹.

In recent years, multidisciplinary obstetric emergency training in the management of SD has been advocated to minimise the risks to the neonate. An intensive regular training regime in one Bristol hospital appears promising in the prevention of NBPP associated with SD but, the introduction of training had no impact over time on the incidence of permanent NBPP in a large Irish teaching hospital^{7, 8}. As permanent NBPP only complicates 2-3/10,000 vaginal births and as caesarean births continue to escalate, it is extremely challenging to produce high quality research which might demonstrate conclusively the advantages of one form of management of SD over the other. It has to be acknowledged, however, that the introduction of practice guidelines and formal training has led to improvements in the contemporaneous recording in the delivery suite records of the details of SD and of its management, which makes it easier to assess the standard of clinical care retrospectively.

Permanent NBPP is costly, most importantly, to the individual affected and their family. It is also costly in financial terms to the State because of the need for long-term medical care and the likelihood of negligence claims. The Taskforce Report highlights that previously held opinions attributing permanent NBPP associated with SD always to substandard care by the birth attendant at the time of delivery are not supported by the scientific evidence, and that large gaps in our knowledge remain. There is a strong case for establishing a national register for NBPP and prioritising research as to how the clinical impact and the associated costs of NBPP may be minimised in the future. There is also an urgency about developing and disseminating our own clinical practice guideline nationally on the management of SD.

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