

## **PREGNANCY DAMAGE AND BIRTH-COMPLICATIONS IN THE CHILDREN OF PARAPLEGIC WOMEN**

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THIS paper is part of the report of the world-wide investigation about pregnancy and delivery in paraplegic patients, which this society decided to start at the Annual Scientific Meeting in 1969. First a questionnaire was distributed to find out which members of the I.M.S.P. could possibly contribute information on this subject. Sixty-six forms were sent to 24 countries, 42 of which were returned, revealing 45 observations of patients who suffered spinal cord injury during pregnancy and some 130 who conceived after their spinal cord lesion. In the latter there were ten spontaneous abortions, three induced abortions, five stillbirths, 147 normal children, 19 without report of their state of health, and three were not yet born.

Among the five stillborn babies we know of one premature infant in the 30th week which showed no sign of malformation, and premature labour was thought to be due to insufficiency of the cervix. A second stillborn baby was due to fatal rhesus-incompatibility and two were born unnoticed by their mothers.

In the first-mentioned group of 45 patients, 31 gave birth to normal healthy children, five had spontaneous abortions; two abortions were induced; one baby was stillborn due to placenta praevia; one child died immediately after birth due to lung immaturity and five babies showed marked disability or malformation.

Out of the 42 spinal units who answered the first questionnaire,<sup>1</sup> 22 offered to give further detailed information about their observations. Considering the fact that malformation of the infants occurred only in those women who suffered spinal cord injury during pregnancy and that spontaneous abortions definitely occurred more often in this group, we put the questions of the second form in order to find out:

- (a) details about the accident, its mechanism and the neurological diagnosis;
- (b) details about the period of the traumatic and spinal shock, such as additional injuries, unconsciousness, abdominal trauma, blood-loss, circulatory and breath insufficiency, anaesthesia;
- (c) secondary complications acting as sources of infection;
- (d) details about pharmacological treatment, vaccinations or serum-therapy, blood transfusions, X-ray-diagnosis;
- (e) anamnestic facts of importance;
- (f) details of gynaecological history;
- (g) all details obtainable of the pregnancy in question including the delivery, the baby's state of health and its further development.

In September 1971 we had data of 40 pregnancies in 26 paraplegic women who conceived after their injury. Analysis revealed a normal number of spontane-

<sup>1</sup> We should like to thank all those who contributed to this investigation.

ous abortions during the first three months, a rather striking number of five premature babies with less than 2500 g. and another two with less than 3000 g. at birth out of 33 pregnancies which lasted more than 6 months. I tend to suppose one should consider the frequency of infections, especially urinary, in connection with this observation. Urinary flare-ups and resistant infections were reported in ten cases, pressure-sores in two, and five of these gave birth to premature or small for date children.

Furthermore, we had details of 22 pregnancies pre-existent to the spinal cord injury. A summary of these case histories leads to the result that five of them ran an abnormal course; in one case an abortion was induced after a suicidal attempt by the mother, resulting in her paraplegia. In another case, a D4 lesion, spontaneous abortion occurred within a few days after the accident which was in the fifth month. In three further cases the children were born with malformations or disabilities, each one being an example of a different injury

### CASE HISTORIES

**Case I. GB-07-CO-A-23-06-47.** A 21-year-old pregnant woman was thrown out of a car in a road accident and was consecutively paralysed below D6 with additional fractures of the sternum, scapula, ribs and skull-base. The patient remained unconscious for 12 hours. X-rays of the cervical and upper dorsal spine and the skull were taken.

The baby was born prematurely with 'median facial defect involving nose, palate and upper lip, underdeveloped cerebrum and partial fusion of the frontal lobes'. This malformation correlates with Ostertag's group III of arhinencephaly (Peters & Lund, 1958) and has its termination period during the very first weeks of gestation.

As a rule, it is mainly a lack of oxygen, infection, intoxication and physical-mechanical factors (Peters & Lund, 1958) which can produce cell damage in an embryo. The further result of this damage, however, is largely dependant on the developmental stage of the embryo or fetus at the time of injury. Cell death between day 0 and 15 usually produces early abortion cell-death between the 15th and 90th day usually causes malformation, later damage can produce hypo- or pseudo-agenesis of organs or part-organs or functional disturbances.

Case I is no doubt an example of intrauterine damage during organogenesis. Compared to the other ten patients with spinal cord injury during the first trimester, this woman suffered the most severe injuries as none of the others were unconscious for more than 1 hour. But there is no significant difference between the possible noxious factors in this case compared with the others which would allow prognosis in the individual situation.

**Case II. D-03-FL-O-10-02-43.** Complete paraplegia below D5 was present in a 23-year-old expectant mother following a frontal car collision. The patient herself was driving. X-rays revealed a hyperflexion-accident-mechanism. At this time she was 17 weeks pregnant. Several ribs were fractured and severe hypotonic regulation, anaemia and urinary infection complicated the further gestation period. Hypotonia and occasional lip cyanosis had already been noticed before the accident occurred. At birth the baby was macrocephalic, soon developed opisthotonus and showed rapid growth of the hydrocephalus.

Careful studies of the neuropathological literature and discussions with paediatricians and neurologists lead us to various conclusions. In this case there was no malformation in the patho-anatomical definition, but rather a loss of nervous tissue occurring after the 90th day of gestation, resulting in the asymmetric pattern of this hydrocephalus. This may be in connection with the trauma, either directly or indirectly, by hypoxaemia. The functionally complete stenosis of the aqueductus Sylvii, however, must have been of a later date than the accident, otherwise one should have expected a more marked hydrocephalus at birth and a relatively slower progression post partum, especially as there proved to be no perinatal intraventricular bleeding. None of the usual intrauterine infections could be traced.

We tend to consider this case as pregnancy damage (probably due to mechanical trauma and/or correlated lack of oxygen, with an additional perturbation during the late gestation period or rather perinatally) causing the completion of the aqueductal occlusion.

**Case III. D-03-SC-G-28-02-39.** A 28-year-old II-gravida was involved in a car accident and consequently suffered a complete paraplegia below D8 and additional fractures of the mandibula with consecutive infection. The patient was then five months pregnant.

Moderate vaginal bleeding during the second month of pregnancy had been reported. X-rays were taken, blood transfusions given and the patient developed deep venous thrombosis. Some days after the calculated date the baby was born without any complication; its head was rather small and the mother's pelvic floor flaccid. A slight swelling of both upper lids increased during the following weeks, especially when the child was crying, but this later receded spontaneously. Because of the lid-swelling, a further investigation of the infant at age six weeks was performed. This revealed: microcephaly; paramedian bony defects of the frontal skull-base with recessus to both orbitae, which were judged to cause the lid-oedema. I tend to call this a rudimental frontal, median encephalocele as described by Pache (1969).

The judgement of the encephalogram was given very cautiously; there was no positive sign of malformation of the cerebral ventricular system and no obvious hydrocephalus. There was found to be right-sided parietal subdural effusion, xanthochrom and of ++ Pandy reaction; muscular hypertonus, a slightly spastic reflex activity of the lower limbs and reduced hip-abduction.

The girl, now four and a half years old, is mentally and physically severely handicapped with predominantly left-sided cerebral palsy.

Surely defects of the median skeleton structures and the closure of the central nervous system are complications of the very early gestation period and cannot be seen as a result of the trauma in the fifth month of pregnancy? The subdural effusion had to be discussed as this tended to be considered as pre-existent to birth rather than as a perinatal complication. This was due to there being absolutely no indication of perinatal distress in the patient. However, there must have been trauma to the abdominal region of the mother, considering the flexion lesion with compression and luxation of the 9th thoracic vertebra. Intrauterine trauma and subdural membranes due to subdural effusion would sufficiently explain the clinical findings and the present state of the child. The origin and significance of the rudimental encephalocele could not be determined.

These last two patients described (cases II and III) belong to a group of

seven who suffered spinal cord injury during the second trimenon. Five of them had D4-D8 lesions, one a cauda and another a C5 lesion. In the D4-D8 lesions we had the already mentioned spontaneous abortion in the fifth month, some days after the accident, and the two babies with cerebral damage. Severe post-traumatic complications, such as long-lasting circulatory and respiratory insufficiency were more often in this group. X-rays were taken in all cases.

It seems to me that the 1st trimenon is not particularly threatened by trauma, but rather by the sum of circumstances leading to lack of oxygen. Furthermore, it seems that it is particularly the 2nd trimenon which is threatened by the trauma, if this hits the abdomen directly *i.e.* by the steering-wheel or indirectly in flexion injuries of the median dorsal spine.

As a result of this investigation we can state that pregnancy complicated by paraplegia is threatened more than in normal circumstances by:

- (a) the trauma itself;
- (b) the immediate post-traumatic situation of the patient;
- (c) by chronic infections and anaemia in pregnancies following the spinal cord injury.

Perinatal complications appeared to be the same as those in normal women apart from severe autonomic dysreflexia which did not become relevant in this investigation.

#### SUMMARY

An investigation including spinal units of 24 countries revealed 187 pregnancies after spinal cord injury and 45 patients who suffered spinal cord injury during pregnancy. Malformations and disabilities occurred only in the latter group (excluding placenta praevia, rhesus-incompatibility). The brain damages can well be seen in connection with the trauma, each one being an example of a different pattern of harm. Premature and small for date children occurred, strikingly, more often in those who conceived after their injury.

#### RÉSUMÉ

Une enquête dans des centres de paraplégiques de 24 pays, révéla 187 grossesses après traumatisme de la moelle et 45 patientes qui eurent leur traumatisme pendant la grossesse.

Des malformations ne furent remarquées que dans le dernier group (en dehors des cas de placenta praevia et d'incompatibilité sanguine foeto-maternelle). Les avortements étaient fréquents.

Lorsqu'il y avait atteinte cérébrale on peut penser qu'elle était en relation avec le traumatisme, en outre, ayant eu lieu à un moment différent de la croissance foetale, on peut estimer qu'il pouvait entraîner un trouble différent.

Un grand nombre de prématurés fut noté dans le group des grossesses survenues après le traumatisme de la moelle.

#### ZUSAMMENFASSUNG

Eine Umfrage in Querschnittgelähmtenabteilungen in 24 Ländern erbrachte eine Zahl von 187 Schwangerschaften nach Eintritt der Querschnittlähmung und eine Zahl von 45 Patientinnen, die während der Schwangerschaft verunglückten. Schwangerschaftsschäden wurden nur in der letzten Gruppe beobachtet (ausgenommen bei placenta praevia, Rh-incompatibilität), Spontanaborte waren ausgesprochen häufig. Die cerebralen Schäden

können im Zusammenhang mit dem Unfall gesehen werden, wobei jeweils verschiedene Schädigungsmomente wirksam wurden. Auffallend viele Frühgeburten und "small for date babies" waren in der Gruppe der Schwangerschaften nach der Querschnittverletzung.

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