OBSTETRIC BRACHIAL PLEXUS PALSY ASSOCIATED WITH BREECH DELIVERY
A DIFFERENT PATTERN OF INJURY

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Most obstetric brachial plexus palsies are due to rupture of the upper roots in babies whose delivery was complicated by shoulder dystocia. If treated by early exploration and grafting, they have a favourable prognosis.

We reviewed 36 babies who had had an obstetric brachial plexus palsy after a breech delivery and found that they had a different pattern of injury; 81% had avulsion of the upper roots. This injury cannot be treated satisfactorily by exploration and microsurgical grafting and carries a considerably worse prognosis for shoulder function.

We review our findings of brachial plexus injuries resulting from breech delivery.

PATIENTS AND METHODS
Between 1979 and 1993, a total of 379 babies underwent exploration of their brachial plexus at either the Hôpital Trousseau (Children’s Hospital) or the Institut Français de la Main in Paris, after injury at birth. In most, exploration took place at or just after the age of three months (Gilbert, Hentz and Tassin 1987; Gilbert, Brockman and Carlioz 1991) and was carried out by the same surgeon (AG).

Of the 379 babies, 36 (9.5%) with 38 shoulders affected, had been born by breech delivery and their notes and operative records were studied. These 36 cases represent all those born by breech delivery referred to the senior author (AG) during the period 1979 to 1993. The operation records of one patient were incomplete. Eighteen patients had a right-sided lesion, nine a left-sided lesion and eight initially had bilateral lesions. This leaves four with bilateral lesions, one of whom was explored only on one side. There were 16 boys and 20 girls with a mean birth weight of 2912 g. This is low because a significant number of babies had a low or very low birth weight (1000 to 2500 g) (Fig. 1). Three of the four babies with a very low birth weight (less than 1800 g) had bilateral palsies.

Table I gives the pattern of injury found at surgical exploration. In 27 shoulders (72.9%), there was no or minimal fibrosis and no neuroma was found. The C5 and C6 nerve roots, sometimes including C7, which usually presents as a neurona in continuity. Brachial plexus injuries after vaginal breech deliveries are associated with a different pattern of injury which appears to be unique to this mode of presentation and carries a considerably worse prognosis.

Table 1. Pattern of injury found at surgical exploration in 37 shoulders after breech delivery

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>Number</th>
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<tbody>
<tr>
<td>Avulsion C5, C6, roots outside spinal canal</td>
<td>10</td>
</tr>
<tr>
<td>Avulsion C5, C6, roots inside spinal canal</td>
<td>17</td>
</tr>
<tr>
<td>Avulsion C5, C6, C7, roots inside spinal canal</td>
<td>3</td>
</tr>
<tr>
<td>Postganglionic rupture C5, C6, neuroma in continuity</td>
<td>4</td>
</tr>
<tr>
<td>Postganglionic rupture C5, C6, no continuity</td>
<td>2</td>
</tr>
<tr>
<td>Postganglionic rupture C5, C6, C7, avulsion C8, T1</td>
<td>1</td>
</tr>
</tbody>
</table>
C6 roots, however, appeared to be very thin and pale and after tracing them up to the exit foraminae they were found to be completely avulsed. In ten cases the spinal ganglion lay outside the spinal canal; in the other 17 the roots were all traced up to the spine. They did not respond to intraoperative stimulation, but no formal avulsion was visualised. In those which had had a preoperative myelogram, however, a meningocele was demonstrated at the site of the suspected avulsion which, together with the poor clinical results, allowed classification of these lesions as avulsions in situ. Studies of intraoperative somaesthetic evoked potentials were performed in the earlier cases, but we have found these to be unreliable and they were therefore abandoned in the remainder of our series.

In three shoulders (8.1%), there was an ‘avulsion in situ’ of the C5, C6 and C7 roots and in four (10.8%) a C5, C6 neuroma in continuity, which was sited high in the plexus, starting just before the junction of the roots and ending at the division of the upper trunk. Two shoulders (5.4%) had ruptures of the C5, C6 roots which were not in continuity, and one (2.7%) had a neuroma of C5, C6, a very high rupture of C7 just at the foramen, and avulsions of C8, T1 with their ganglia lying outside the spinal canal.

Operative procedures. When obvious avulsions of C5 and C6 were seen, an immediate neurolisation of the musculocutaneous nerve was carried out. In one baby, C7 was seen to give a branch to the musculocutaneous nerve and this was therefore left alone. In those in whom there was a high suspicion of an avulsion in situ, half had immediate neurolisation of the musculocutaneous nerve and in the other half, an expectant attitude was adopted in the hope that spontaneous recovery might occur. Surprisingly, there was some return of function in three patients, but most showed no recovery and had a neurolisation of the musculocutaneous nerve at a second operation six months to two years later.

Although some restoration of elbow flexion was achieved in all but two children after musculocutaneous nerve grafting, shoulder function was not improved and in those who were followed up for more than five years, at least one, and often two or three additional procedures were needed to improve shoulder function. Trapezius to shoulder transfer, latissimus dorsi transfer, or subscapularis release were commonly used.

The remaining babies who showed the more classical patterns of injury without avulsion of the upper roots, had standard microsurgical grafting, using one or both sural nerves as cable grafts.

RESULTS AND DISCUSSION

The incidence of bilateral cases is normally 5% (Hardy 1981; Zancolli 1981; M´etaizeau and Lemelle 1991) but in our series eight cases (22.2%) were initially bilateral. Although a spontaneous unilateral recovery occurred in four babies, the remaining four (11.1%) required bilateral operative procedures. Three of these had a very low birth weight.

Spontaneous recovery of a brachial plexus birth palsy sometimes occurs. Reported rates vary widely, ranging from 7% to 76% (Gordon et al 1973; Hardy 1981; Camus et al 1988).

Traction injuries of a neonate’s brachial plexus are due to a difficult delivery but a difference in injury pattern between palsies associated with breech deliveries or cephalic presentations has not previously been described in detail. Our series agrees with previous estimates that breech deliveries carry a five times greater risk of obstetric brachial plexus palsy (Métaizeau 1993).

In a normal series of obstetric brachial plexus palsies (Table II), 75% of cases will have isolated ruptures of C5, C6 or C5, C6, C7 with or without a neuroma in continuity.
incomplete avulsion in situ and that enough fibres remained connected to the spinal cord for nerve regrowth to occur in an orderly manner. In all, spontaneous recovery occurred in 20% of cases in which an avulsion was suspected but no spinal ganglia were found outside the bony canal.

In the remaining 19% of our series, again only the upper roots were involved, but the lesions were not avulsions. The only exception was a very severe and complete total brachial plexus palsy.

Our findings strongly suggest that extreme caution should be taken in breech deliveries, particularly in premature babies who have a higher risk of sustaining an obstetric brachial plexus palsy (Narakas 1987). In addition, the surgeon should be aware of these facts so that he can inform the parents of the likelihood of immediate neurotisation and further operative procedures. In the case of suspected avulsions of the upper roots in which no spinal ganglion is found outside the spinal canal, we recommend an expectant attitude for six months before considering a neurotisation as there is a one in five chance of spontaneous recovery.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCES


Table II. Main differences in injury pattern between breech and cephalic presentation, by percentage

<table>
<thead>
<tr>
<th></th>
<th>Breech</th>
<th>Cephalic</th>
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<tbody>
<tr>
<td>Ruptures C5, C6 ± C7</td>
<td>16</td>
<td>75</td>
</tr>
<tr>
<td>Avulsion C5, C6 ± C7</td>
<td>81</td>
<td>0.5</td>
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Table III. Comparison of shoulder function according to Mallet (1972) after exploration and microsurgical repair, by percentage

<table>
<thead>
<tr>
<th>Mallet grade</th>
<th>Breech</th>
<th>Cephalic</th>
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<tbody>
<tr>
<td>II</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>III</td>
<td>59</td>
<td>9</td>
</tr>
<tr>
<td>IV/V</td>
<td>11</td>
<td>81</td>
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