Obstetrical brachial plexus injuries: incidence, natural course and shoulder contracture

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Abstract

The incidence of obstetric brachial plexus injury (OBPI) was investigated and the natural course of this disorder and the frequency of shoulder contracture described. Between 1988 and 1997, 13,366 children with a gestational age of 30 weeks or more, were born in the Academic Medical Center, Amsterdam. Of these, 62 had an OBPI (4.6 per 1000). Complete neurological recovery occurred in 72.6% of cases. Half of them had a delayed recovery of more than three weeks (mean recovery time 6.2 ± 3.1 month). Shoulder contracture occurred in at least one-third of the children with delayed recovery and in at least two-thirds of the children with incomplete recovery.

The incidence of OBPI in our hospital was found to be higher and to have a less favourable natural course than is usually reported in the literature. Contracture of the shoulder joint is frequently found even in infants with complete neurological recovery.
Introduction

Obstetrical brachial plexus injury (OBPI) is caused by excessive traction on the brachial plexus during birth. The incidence of OBPI as reported in the literature varies from 0.9 to 2.3 per 1000 live births\(^1\)\(^2\)\(^3\)\(^4\)\(^10\)\(^12\). However, one study did report an incidence of 4.4 per 1000\(^9\). The natural course is diverse and depends on the extension and severity of the nerve lesions. The recovery rate is usually reported as 80-90\%\(^2\)\(^4\)\(^6\)\(^12\). One of the complications of OBPI is contracture of the shoulder joint. It has been emphasised that long-standing contractures can cause bony deformities, and that prevention of contractures should be an important part of the treatment\(^2\)\(^5\)\(^7\)\(^8\)\(^13\)\(^15\). However, the prevalence of contractures within a cohort of children with OBPI has never been established.

In recent years we felt that the incidence of OBPI had increased, that the long-term outcome was not as favourable as reported in the literature, and that shoulder contracture often occurred. For this reason renewed investigation into the incidence and natural course of the injury and into the prevalence of shoulder contracture has been carried out.

Patients and methods

The study group consisted of all singletons with a gestational age of 30 weeks or more, born between 1 January 1988 and 1 January 1997 in the Academic Medical Center (AMC), Amsterdam. The outcome measure was an OBPI diagnosed directly post partum by physical examination. All children were seen by a physiotherapist to instruct the parents in handling the baby. Frequent and gentle exercises, putting all joints through a full range of motion, were cornerstones in the prevention of contractures.

Investigation into the clinical course was carried out using case notes from the out-patient clinical records of the Departments of Paediatrics, Neonatology and Rehabilitation Medicine. Based on the extent and progress of neurological recovery the children were divided into three subgroups:

- **Group A**: Complete neurological recovery within three weeks, indicating that all injured nerves just had a first degree damage according to the Sunderland classification\(^11\).
- **Group B**: Complete neurological recovery after three weeks. This means that the most severely damaged nerves had a second degree injury.
- **Group C**: Incomplete neurological recovery. At least one group of muscles remained paretic, indicating Sunderland’s grades 3, 4 or 5.

In young infants it is very difficult to obtain accurate strength grades. Normal active range of motion was looked upon as complete neurological recovery, although this does not necessarily
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Indicate normal strength. In practice almost all children of group B and C were assessed in the department of Rehabilitation Medicine by one of the authors (AFH). Groups A and B have been evaluated separately because of the different risk of contractures. Shoulder contracture was defined as a passive range of motion of the ipsilateral shoulder of at least 10 degrees less than the contralateral side in at least one plane. When this information could not be found in the case records, then we scored this item as unidentified. Passive range of motion was only found to be documented in the records of Rehabilitation Medicine, assessed by one of the authors (AFH).

Results

Between January 1988 and January 1997 13,366 children with a gestational age of 30 weeks or more, were born in the AMC. Of these 62 had an OBPI, an incidence of 4.6 per 1000. Table 1 shows the natural course of the OPBI and the frequency of shoulder contractures.

Table 1. Correlation between neurological recovery and the occurrence of shoulder contracture in the 62 OBPI children

<table>
<thead>
<tr>
<th>Recovery of OBPI</th>
<th>N</th>
<th>%</th>
<th>Neurosurgery</th>
<th>Contractures(^a)</th>
<th>Subscapular release</th>
</tr>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
<td>-</td>
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<tr>
<td>&lt; 3 weeks</td>
<td>22</td>
<td>35.5%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt; 3 weeks(^b)</td>
<td>23</td>
<td>37.1%</td>
<td>-</td>
<td>7</td>
<td>7</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Incomplete recovery</td>
<td>17</td>
<td>27.4%</td>
<td>11</td>
<td>11</td>
<td>3</td>
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</tbody>
</table>

\(^a\) Contractures: +, documented contractures; -, documented normal passive range of motion; ?, unidentified.

\(^b\) Mean recovery time 6.2 ± 3.1 months
Discussion

Incidence

The 4.6‰ incidence of OBPI in our study population is higher than is usually reported.\textsuperscript{1,3,4,10,12} In an article about the obstetric risk factors we described some possible reasons for this.\textsuperscript{14}

Neurological recovery

In this study the natural course of OBPI appears to be worse than is generally described in the literature in which recovery rate is reported to be 80-90%.\textsuperscript{2,4,6,12} In our group 72.6% showed complete recovery. This may be attributed to our definition of ‘complete neurological recovery’ as normal muscle strength in all muscle groups together with normal sensibility. On the other hand ‘remaining paresis’ indicates persistent loss of strength in any muscle group even though the function of the upper extremity may be satisfactory. In the literature the term ‘complete recovery’ is often poorly defined. Michelow et al\textsuperscript{6} in their description of the natural course follow Narrakas’ classification: “ ‘poor recovery’ is defined as elbow flexion of one-half or less than one-half the normal range and shoulder abduction of less than one-half the normal range; otherwise the recovery is considered to be ‘good’ “. We believe that our definitions of complete and incomplete recovery are more accurate in determining the outcome. However, we do not know if the difference in definitions is the only explanation for the worse outcome in our study.

Twenty-three children (37.1%) had a full but delayed recovery. The mean recovery time was 6.2 ± 3.1 months. In the literature this group has never been described separately.

Shoulder contracture

Functional deterioration because of a contracture or joint deformity in OBPI has been previously reported.\textsuperscript{2,5,7,8,13,15} These are data from specialised referral centres. The incidence, however, of these sequelae has not been reported so far. In the present study, groups B and C could be analysed with respect to the presence of shoulder contracture. In group B this reportedly occurred in 7 of the 23 cases (30.4%). The case notes of nine infants did not provide any information with respect to the function of the shoulder joint. It is therefore likely that the incidence is higher. We consider this a major problem as it concerns continuing functional complications in children whose original condition - the plexus injury - is fully recovered. In group C this happened much more frequently: a shoulder contracture was documented in 11 cases (64.7%). The importance of this, however, is not as easily understood as in group B, because the use of the arm is already restricted by the remaining paresis.
Conclusion

The incidence of OBPI in our study group is higher than is usually reported. Careful neurological follow-up demonstrated a higher prevalence of incomplete recovery than is generally described. A shoulder contracture as a complication of OBPI frequently occurs, also in children with full but delayed recovery of their plexus injury. We consider it important to know more about the risk factors and the long-term outcome of contractures and to develop a strategy that may prevent this complication. In our ongoing prospective study of infants with OBPI special attention is now given to the aetiology and development of contractures and bony deformities.

Reference List


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