Chapter 1

Introduction
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An obstetrical brachial plexus injury (OBPI) is a traction lesion of the brachial plexus during delivery. Immediately after birth there is no certainty about the prognosis of a child with an OBPI. Depending on the severity of a traction lesion, nerve function can return (1) completely within a few days or weeks, (2) completely after several months to one year, (3) incompletely, or (4) not at all. The various nerves and roots of the brachial plexus can sustain different degrees of lesions. Therefore, children with an OBPI can show all kinds of natural course, as can be seen in Figures 1a-c and 2a-c. Immediately after birth, the extent of the nerve lesions

Figures 1a-c. Three children, all 6 months of age, showing various rates of neurological recovery. The girl in Figure 1a shows complete paralysis of her left arm. The girl in Figure 1b has rather good active elevation at the right side; but she has no active external rotation, resulting in the presence of a “trumpet’s sign”. The girl in Figure 1c has accomplished almost full active range of motion in her left arm.
Figures 2a-c. Three older children, with various degrees of neurological recovery. The 9 year-old girl in Figure 2a suffers severe limitation of active shoulder movements of her left arm. The 6 year-old boy in Figure 2b shows clear residual paresis of his right shoulder musculature, but has no serious functional problems. The 6 year-old girl in Figure 2c has achieved almost complete neurological recovery of her right-sided OBPI.

is unknown, and therefore no information can be given to the parents about the prognosis of their child’s condition.

Children with an OBPI need treatment in order to achieve optimal motor function and to prevent the occurrence of contractures. The current treatment modalities are exercises or surgical intervention. However, despite intensive treatment, contractures can occur. Especially
shoulder contractures develop frequently, even in children who eventually achieve complete neurological recovery. This is of great concern to us, since these children did recover from their neurological lesion, but nevertheless can remain impaired because of these contractures. To make the appropriate choice between the various treatment options, it is necessary to be informed about the possible outcome as accurately and as quickly as possible.

Definitions concerning neurological recovery
In our studies we have described “complete neurological recovery” as normal muscle strength in all muscle groups together with normal sensibility. “Incomplete neurological recovery” was defined as loss of strength in any muscle group, even when the function of the upper limb was satisfactory.

We have chosen for these definitions because this dichotomy can be made unambiguously after a normal neurological examination. This is not the case in descriptions like “satisfactory recovery”, or “substantial recovery”. We realise, however, that full muscle strength together with normal sensibility, does not automatically mean normal muscle performance. Therefore, also when using our strict definitions concerning neurological recovery, our conclusions on this subject might even be too optimistic.

Goal of the thesis
To obtain optimal insight into the magnitude of the problems concerning OBPI, knowledge of the incidence, the neurological outcome and possible complications in a complete cohort of OBPI children is necessary, and possible predicting factors should be identified. The aim of this thesis is to provide insight into these three aspects separately and in terms of their interdependent association. As a result, recommendations will be made for treatment and future research.

Outline of the thesis
This thesis describes studies of two different cohorts, that partly overlap, and a literature review.

The first part of this thesis describes a cohort study of all babies born alive during a period of 9 years (‘88 - ‘97) in the Academic Medical Center (AMC) in Amsterdam. Outcome variables and possible risk factors were identified by using the databases of the Departments of Obstetrics and Neonatology, and case notes from the medical records of the Departments of Paediatrics and Rehabilitation Medicine.
Chapter 2 addresses a study that was carried out to determine the incidence of OBPI and possible predicting factors. A multivariate logistic analysis of these factors was performed for all children with an OBPI, and separately for the non-recovered OBPI cases.

Chapter 3 describes the neurological recovery of the children with an OBPI in the same cohort, together with the frequency of shoulder contractures, as documented in the medical records.

Chapters 4 and 5 present the results of a historical cohort study of all children with an OBPI, born in the AMC during a period of 7 years (‘91 - ‘98). All children were treated equally and evaluated at fixed time-intervals by one examiner, who also performed a final physical and radiographic examination.

Chapter 4 focuses on neurological recovery. The purpose of the study was to investigate the rate and extent of neurological recovery in OBPI and to identify possible prognostic factors related to neurological recovery.

Chapter 5 focuses on shoulder complications. The aim of the study was to determine the prevalences of contracture and osseous deformity of the shoulder, and also their interdependent association, and to identify possible risk factors for these complications.

The last part of this thesis focuses on conservative treatment modalities; this concerns current treatment options, changes in treatment during the last century, and recommendations for the future.

Chapter 6 presents a case study of a child with a serious shoulder complication, despite complete neurological recovery. The case study is followed by a review of the literature from 1900 until 2001 on the conservative treatment of OBPI with respect to the prevention of shoulder complications.

Chapter 7 consists of the general discussion. This is focused on the three aspects of OBPI that are described in the previous chapters, namely incidence, neurological recovery and shoulder complications. As a result, recommendations are made for treatment and future research on OBPI.