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Original Article

Relationship of age and type of obstetric brachial plexus paralysis in forearm pronosupination☆

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ABSTRACT

Objective: To evaluate the arc of forearm pronosupination of patients with sequelae of birth paralysis and correlate with these variables.
Methods: 32 children aged between 4 and 14 years with total or partial lesions of the brachial plexus were evaluated; measurements of pronation and supination, active and passive, were made, both on the injured side and the unaffected side.
Results: A statistically significant difference was observed between the injured side and the normal side, but there was no difference between the groups regarding age or type of injury.
Conclusion: The age and type of injury did not impact on the limitation of the forearm pronosupination in children with sequelae of birth paralysis.

Relação entre a idade e o tipo de paralisia obstétrica do plexo braquial com o movimento de pronossupinação do antebraço

Palavras-chave:
Plexo braquial
Paralisia obstétrica
Supinação
Antebraço

RESUMO

Objetivo: Avaliar o arco de pronossupinação do antebraço dos pacientes com sequela de paralisia obstétrica do plexo braquial e correlacionar com essas variáveis.
Métodos: Foram avaliadas 32 crianças entre 4 e 14 anos, com lesões totais ou parciais do plexo braquial, foram tiradas as medidas de pronação e supinação, ativa e passiva, tanto do lado lesionado quanto do lado não afetado.
Resultados: Observou-se diferença estatisticamente significativa entre o lado lesionado e o lado normal, porém não houve diferença entre os grupos por faixas etárias, nem quanto ao tipo de lesão.

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Conclusão: Os fatores idade e tipo de lesão não tiveram efeito sobre a pronossupinação nas crianças portadoras de sequela de paralisia obstétrica do plexo braquial.

Introduction

Brachial plexus lesion in newborns occurs during the period of delivery, and is often associated with shoulder dystocia, gestational or pre-gestational diabetes, and macrosomic fetuses, or even low-weight children with pelvic presentation. The first clinical description occurred in 1764, when Smellie reported bilateral paralysis in a pelvic newborn. However, the term obstetric paralysis was attributed to Duchenne in 1872. It is characterized by a flaccid paralysis, which affects the limb partially or totally, depending on the number of roots involved.

The incidence of obstetric brachial plexus paralysis (OBPP) in the United States is 0.38–2.6 per one thousand full-term children, affecting both genders equally. In spite of advances in obstetrics, this incidence has not been reduced.[1]

Narakas[2] classified the children with OBPP into four groups: group 1 with lesions of only C5 and C6 (extended Erb) roots, group 2 with involvement of C5, C6 and C7 roots (extended Erb), group 3 with lesions of all plexus roots, and group 4 that has the Claude Bernard-Horner sign associated with the total lesion.

Most OBPP patients have spontaneous recovery; it is greater than 80% in groups 1 and 2.[2,3] Normal limb function is expected if recovery occurs in the first four years of life. However, in a considerable portion, such recovery will not occur.[4] Residual paralysis and its sequelae in daily life activities are related to the severity of the initial injury, and may range from minimal loss of upper limb function to complete paralysis.[5]

Patients with proximal root lesions (C5, C6, C7) or with total brachial plexus lesions who had partial recovery tend to develop a deformity in supination of the forearm over time, due to the imbalance between the active supination muscles and paralyzed pronator muscles. This imbalance occurs because the biceps, innervated by the musculocutaneous nerve, and the supinator, innervated by the radial nerve recover, while the pronators teres and quadratus, innervated by the median nerve do not usually recover.[5–7] Initially, the deformity can be corrected passively, but with development, the deformity becomes fixed due to the contracture of the interosseous membrane. The hand assumes a position in supination and hyperextension, aggravated by the lack of wrist flexors.

Bahm and Gilbert,[6] Zancolli,[8] Masse,[9] Manske et al.,[10] among other authors, recommend tendon transfers in the initial phases, when the deformity is not yet fixed.

Kapandji[11] described a progressive radius deformity, in which its curvature was not formed due to the paralysis of the pronator musculature, which further limited the pronation.

When a fixed deformity already exists, the pronation osteotomy of the forearm is used to achieve a better positioning of the hand, thus conferring greater use to the affected limb.[11–13]

The aim of this study was to evaluate the degree of forearm pronosupination in children with OBPP sequelae, and to correlate the deformity with the type of lesion and the age group.

Material and method

This paper was approved by the Ethics Committee of the institution under number CAAE-03724712.1.0000.5479.

A retrospective cross-sectional study was carried out, in which 36 children with OBPP and upper trunk lesions (C5 and C6), upper and medium trunk (C5, C6 and C7) or total lesions who had partial recovery and who had not undergone a surgical procedure on the forearm were evaluated between July and December 2012. Three children with associated cerebral palsy, and one child with bilateral brachial plexus lesion were excluded.

The passive (PS) and active (AS) supination degrees, and passive (PP) and active (AP) pronation degrees were measured on the injured and normal sides. Measurements were taken when the child kept the shoulder near the trunk, and with the elbow at 90 degrees; this was always performed by the same evaluator, with the aid of a goniometer and expressed in angle degrees. The results are shown in Table 1.

For statistical analysis, we used the software IBM-SPSS (Statistical Package for Social Sciences) version 17.0, and Excel Office 2010. We compared the measurements of the affected limb with those of the normal limb, with the anatomical classification, and with age. We used the paired Student *t* test to compare the affected limb and the normal limb measurements. In order to evaluate whether there was a relation of age or type of injury to the measurements performed on the injured side of these children, we used the Anova test (Analysis of variance). We also used the Kruskal–Wallis test to compare age groups, and the Mann–Whitney test to compare types of injury (total or partial). We consider $p < 0.05$ as statistical significant.

Results

Thirty-two children were selected for the study, 18 were male and 14 female. Regarding the affected side, 17 had lesions on the right side and 15 on the left side. The age ranged from four to 14 years, with an average of 7.6.

For statistical analysis, the children were divided into two groups according to the type of lesion: group 1 with partial lesions (11 patients) and group 2 with total lesions (21 patients) (Fig. 1). Regarding age, children were grouped into three age groups: range 1, from four to six years, range 2, from seven to nine years, and range 3, above 10 years (Fig. 2).