Erb-Duchenne’s Palsy: a literature review

Paralisia de Erb-Duchenne: uma revisão de literatura

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ABSTRACT

Background: Erb-Duchenne’s Palsy is one of the most common birth-related paralysis and consists of stretching or avulsion of the spinal cord roots in neonates at the time of delivery when there is hyperflexion of the neck or by longitudinal traction of the arm, causing damage to the roots C4 to C6 and affecting the upper trunk. This type of injury presents several pre gestational and gestational risk factors, such as obesity, age over 35 years, fetal macrossomia and delivery with forceps. Methods: The systematic literature review was made over a research in the National Library of Medicine (Pubmed), Scientific Electronic Library Online (Scielo), and Latin American and Caribbean Literature in Health Sciences (Lilacs) databases with the keywords “erb duchenne palsy” and “erb duchenne paralysis” from 2012 to 2022, regardless of gender and age group of the child. Abstracts, articles not available free of charge and those that do not involve paralysis of the upper trunk of the brachial plexus in childbirth were excluded from this study. Results: Initially, 27 publications were found in Pubmed, none in Scielo and six in Lilacs, based on the characters mentioned in the methodology. After applying the exclusion criteria, five articles published in Pubmed and three in Lilacs were selected. Conclusion: nerve transposition surgery has a better motor outcome in children, but should be performed only in patients with relevant indications.

Keywords: Erb-Duchenne; Paralysis; Motor dysfunction; Pediatric Neurosurgery

RESUMO

Introdução: A paralisia de Erb-Duchenne é uma das paralisias relacionadas ao nascimento mais comuns e consiste no estiramento ou avulsão das raízes da medula em neonatos na hora do parto quando há hiperflexão do pescoço ou pela tração longitudinal do braço, provocando danos nas raízes C4 a C6 e acometendo o tronco superior. Esse tipo de lesão apresenta diversos fatores de risco pré-gestacionais e gestacionais, como obesidade, idade superior a 35 anos, macrossomia fetal, e parto com fórceps. Métodos: foi realizada uma revisão sistemática da literatura com pesquisa nos bancos de dados National Library of Medicine (Pubmed), Scientific Electronic Library Online (Scielo), e Literatura Latino-americana e do Caribe em Ciências da Saúde (Lilacs) com os caracteres “erb duchenne palsy” e “erb duchenne paralysis”, no período de 2012 a 2022, independente do gênero e faixa etária da criança, sendo excluídos resumos, artigos não disponíveis gratuitamente e aqueles que não envolvem a paralisia do tronco superior do plexo braquial a partir do parto. Resultado: Inicialmente encontrou-se 27 publicações no Pubmed, nenhuma no Scielo e seis no Lilacs. Após aplicação dos critérios de exclusão, três artigos publicados no Pubmed e três no Lilacs foram selecionados. Conclusão: a cirurgia de transposição de nervos é a opção onde nota-se melhor desenvolvimento funcional nos pacientes, porém deve ser realizada apenas em pacientes com indicações pertinentes.

Palavras-chave: Erb-Duhenne; Paralisia; Disfunção Motora; Neurocirurgia Pediátrica

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Neonatal Brachial Plexus Palsy, or Erb-Duchenne's Palsy, was first clinically described in 1764 by William Smellie, and later by Erb and Duchenne, in 1874 and 1872, who described the pathophysiology and anatomy of the lesion in the nerve roots which are the cause of such pathology in the baby, and then receiving the eponymous1,2. Erb-Duchenne's Palsy is one of the most common birth-related paralysis and consists of stretching or avulsion of the spinal cord roots in neonates at the time of delivery when there is hyperflexion of the neck with the shoulder fixed or by longitudinal traction of the arm, causing damage to the roots C4 to C6 and affecting the upper trunk2. This type of injury presents several pre gestational and gestational risk factors, such as: obesity, age over 35 years, shoulder dystocia, fetal macrosomia, presentation of vertex and delivery with forceps or under instrumentation. The incidence ranges from 0.5 to 3.0 cases per 1,000 live births and so far there are no concrete data on Brazilian incidence about this pathology, which may be associated with the higher number of cesarean sections performed in the country1,2.

Diagnosis is made after birth, with the weakness or paralysis of the muscles responsible for shoulder flexion and supination, more frequent on the right and with the evaluation through motor movement it is possible to identify the spinal level affected1. About 70-95% of cases evolve with spontaneous recovery in the first weeks after delivery and should be followed by physiotherapists until completing at least one month of life, but there are cases in which the baby can develop deformities in the shoulder joint if a surgical intervention is not performed. Primary surgical techniques consist of brachial plexus dissection (neurolysis), neuroma resection, nerve graft or nerve transfer (neurotization), when a satisfactory response is not obtained after the surgery of choice, a secondary procedure may be chosen, such as arthrodesis or tendon transfer3,4.

This study aims to perform a systematic review on Erb-Duchenne's Palsy, describe the importance of the correct anatomical description of peripheral nerve lesions for better clinical and/or surgical follow-up in these individuals and to point out unique aspects of Erb-Duchenne's Palsy.

This is a systematic literature review in the National Library of Medicine (Pubmed), Scientific Electronic Library Online (Scielo), and Latin American and Caribbean Literature in Health Sciences (Lilacs) databases with the keywords “erb duchenne palsy” and “erb duchenne paralysis”, from 2012 to 2022, regardless of the gender and age group of the child. Abstracts, articles not available free of charge and those that do not involve paralysis of the upper trunk of the brachial plexus in childbirth were excluded from this study. The inclusion criteria were articles discussing labor with dystocia, trauma, and/or avulsion of the upper trunk of the brachial plexus. Exclusion criteria were the thematic scope that includes: complete paralysis of the brachial plexus, lower trunk and upper trunk paralysis in pediatric patients due to secondary etiologies; and upper trunk paralysis in adults and physiotherapy. Subsequently, the results of surgical treatments were analyzed.

Initially, 27 publications were found in Pubmed, none in Scielo and 06 in Lilacs databases, based on the characters mentioned in the methodology. After applying the exclusion criteria, five articles published in Pubmed and three in Lilacs were selected. It was included those who used surgery as treatment, and neurolysis was the main technique using other nerves to replace the affected nerve. After the removal of articles out of the scope of this literature review, 6 articles about plexopathies were excluded; 14 brachial plexus paralysis in general (including physiotherapy treatments); three describing Erb-Duchenne's Palsy, but without description of age group; authors who described Erb-Duchenne's Palsy as brachial plexus palsy; one article has described as Klumpke's Palsy; one article that showed data on median nerve injury without paralysis; one article on chronic neuralgia of the brachial plexus; and one article on Supplementary Motor Cortical Alterations and not on study paralysis were excluded (Flowchart 1).
Results here described were obtained from 6 articles with data based on 1 non-randomized trial, 1 prospective randomized controlled trial, 1 case-controls, 1 series of cases, 1 retrospective review and 1 randomized clinical trial. All authors used surgery as a treatment, and the main technique used was nerve transfer, with variation of the nerves used, and only one author used the literature to describe the technique instead of clinical studies (Table 1).

According to Miyazaki et al., five patients underwent the treatment of anterior release of the shoulder by arthroscopic approach and transfer of the tendon from the large dorsal muscle to the posterolateral part of the tubercle major, which obtained passive and active lateral rotations improvement while the medial rotation worsened, concluding that there is viability in the described technique.

In Little et al., 31 patients were selected with indication for treatment with ulnar nerve transfer, Oberlin surgery, in order to restore elbow flexion and decrease muscle denervation time.

**Table 1.** Description of the procedures and outcomes for the treatment of Erb-Duchenne’s Palsy according to searching authors.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Procedure</th>
<th>Treatment result</th>
</tr>
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<tbody>
<tr>
<td>Abdelaziz et al.</td>
<td>Surgical: anterior release of the subscapularis tendon with a transfer from the larger round to the infraspinous tendon.</td>
<td>Anterior release of the subscapularis tendon with a transfer from the larger round to the infraspinous tendon significantly improves shoulder function in patients with Erb’s Palsy with internal rotation contracture.</td>
</tr>
<tr>
<td>Abdelaziz et al.</td>
<td>Surgical: larger round transfer.</td>
<td>It seems that the modification of the trapezoid transfer using bone fragments of the acromion allows a more direct traction and, therefore, a better mechanical advantage of the transfer.</td>
</tr>
<tr>
<td>Figueiredo et al.</td>
<td>Surgery: Transfer of fascicle from ulnar nerve to motor branch of the musculocutaneous nerve.</td>
<td>Oberlin surgery is a possible option for recovery of elbow flexion in children with neonatal plexopathy, demonstrating, however, very heterogeneous results, even in long-term follow-up.</td>
</tr>
<tr>
<td>Valbuena, 2015</td>
<td>Surgery: Transfer of the spinal accessory nerve to suprascapular nerve.</td>
<td>The functional results obtained are consistent with those of other reports.</td>
</tr>
<tr>
<td>Little et al.</td>
<td>Surgery: transfer of the fascicle of the median and/or ulnar nerve.</td>
<td>87% of the thirty-one patients had functional elbow flexion (AMS ≥ 6), and 77% had total recovery of elbow flexion against severity, of the twenty-four patients for whom supination recovery was recorded, five (21%) had functional recovery.</td>
</tr>
<tr>
<td>Miyazaki et al.</td>
<td>Surgical: anterior arthroscopic shoulder release and transfer of the large dorsal.</td>
<td>Passive and active lateral rotations increased, while medial rotation decreased.</td>
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</tbody>
</table>
Of the sample evaluated, 87% presented recovery of functional elbow flexion, while 77% obtained full recovery from elbow flexion against severity, of the 24 patients registered for supination recovery, five (21%) obtained functional recovery. Other authors also used Oberlin surgery, which aims to restore the movement of bending the elbow in high brachial plexus lesions as the chosen treatment. Figueiredo et al. showed 11 patients submitted to surgery because they did not present spontaneous improvement of paralysis from delivery to the first year of life and follow-up on an average of 8 years after surgery, 27.3% (n=3) of the patients were considered functional and the rest presented some heterogeneity in relation to the movement against severity even with a prolonged follow-up time.

In another study, Valbuena described the improvement in shoulder function and muscular power comparing the values pre and post surgery. For shoulder abduction and external rotation, the preoperative measurements were 0.48 and zero meters, respectively. Postoperative values were 2.7 and 2.4 meters, using the neurotization technique and transferring the spinal accessory nerve to suprascapular nerve, resulting in significant functional differences.

According to Abdelaziz et al., with a sample of 35 patients, the tendon transfer technique in patients with shoulder movement limitation, abduction and external rotation can be performed with the transfer of only the larger round muscle or added to the trapezoid transfer. The indications would be: if the patient has abduction ≥ 90°, the transfer of only the larger round is recommended; if the patient has abduction < 90° and a weak muscle strength of the deltoid, the combined procedure is more indicated. If no satisfactory improvement is achieved, tendon transfer from the trapezoid muscle can be performed later. It is noted that the modification of the trapezoid transfer using bone fragments of the acromial allows a more direct traction and, therefore, a better mechanical advantage of the transfer.

According to Abdelaziz et al., in a study conducted with 20 pediatric patients, in their findings the surgical procedure for the release of the subscapularis tendon is done to restore external rotation of the shoulder in patients with failure of external rotation and shoulder abduction. The release is performed by transferring the tendon from the major round muscle to the infraspinal muscle tendon, obtaining promising results in relation to the significant improvement in passive and active movements of abduction and external rotation of the shoulder in patients with Erb-Duchenne’s Palsy.

Erb-Duchenne’s Palsy is a disease with prognostic variety, and becomes dependent on the early diagnosis and degree of injury of the patient. Usually, rupture injury has the worst prognosis, with disruption of the roots of the medulla causing irreversible damage to the axon, myelin sheath and nerve support structures. In these cases, in an attempt to regenerate the proximal extremity, the neuroma is formed. The diagnosis is usually clinical and presents with a history of injury at birth, common the classic sign of “Waiter’s Tip Hand”. On neurological examination, specific findings are observed in children: loss of arm flexion (biceps muscle paralysis), absence of Moro reflex of the affected hemibody, atrophy of the deltoid, biceps and brachial muscles. However, magnetic resonance imaging, tomography, radiography, electromyography and myelography can be used for diagnosis.

TREATMENT

Treatment for children with Erb-Duchenne’s Palsy should be initiated shortly after diagnosis. Physiotherapy and occupational therapy act as conservative treatment, and should be performed in a multidisciplinary manner with the objective of improving the quality of life of these individuals. It is important to highlight that for the treatment of obstetric brachial plexus palsy there is a need for clinical evaluation, however, regardless of the type of lesion, it is agreed that conservative treatment should start as earlier as possible. In cases where spontaneous recovery is not noted in the first months of life, the surgical approach should be considered. There are studies demonstrating beneficial results for neurolysis treatments along with nerve transfer. Thus, there are three possibilities for surgical approach: external neurolysis, nerve graft and nerve transfer.

CONCLUSION

Patients with Erb-Duchenne’s Palsy are affected by motor and sensory dysfunction due to shoulder traction at the time of delivery. Nerve transposition surgery to the site of the injury is the option where a good functional improvement is noted in these patients, but should be performed only in patients with relevant indications.
Thus, it needs efforts to instruct parents on how to act in the face of the perception of signs and symptoms of suspicion in their children. Moreover, a greater knowledge about the disease for health professionals about the importance of performing early diagnosis and management.

REFERENCES


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