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Isolated Radial Nerve Palsy in a Newborn: Case Report

Parálisis del nervio radial neonatal: Relato de un caso

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Abstract

Isolated radial nerve palsy (IRNP) in the newborn is a rare clinical condition that must be distinguished from entities that are more common, such brachial plexus birth palsy (BPBP). It should be suspected in newborns presenting with absent wrist and digital extension but intact deltoid, biceps, and triceps function, as well as wrist and digital flexor function. Whereas BPBP is highly variable depending on the extent of the neurological involvement, IRNP resolves spontaneously, regardless of the severity of the initial presentation. We herein present a case of newborn with IRNP whose initial diagnosis was of BPBP.

Keywords
- isolated radial nerve palsy
- brachial plexus palsy
- newborn

Resumen

La parálisis radial neonatal aislada (PRNA) es un cuadro clínico infrecuente que debe distinguirse de otras entidades más frecuentes, como la parálisis braquial obstétrica (PBO). Debemos sospechar una PRNA en neonatos que presentan incapacidad para la extensión de muñeca y de dedos, pero mantienen intacta la función del deltoides, del bíceps, y del tríceps, así como la flexión de muñeca y de dedos. Mientras la PBO tiene una evolución clínica variable dependiendo de la extensión de la lesión neurológica, la PRNA presenta una resolución espontánea, independientemente del grado de afectación inicial. Presentamos el caso de un recién nacido con PRNA cuyo diagnóstico inicial fue de PBO.

Palabras clave
- parálisis radial aislada
- parálisis braquial
- recién nacido

Introduction

Isolated radial nerve palsy (IRNP) is a very rare clinical condition that occurs in newborns. It is necessary to make a differential diagnosis with brachial plexus birth palsy (BPBP), whose clinical course is variable, depending on the extent of nerve involvement. Isolated radial nerve palsy is characterized by a functional inability to extend the wrist and fingers, with preserved function of the shoulder, of the elbow, and flexion of the wrist and fingers. Unlike BPBP, IRNP usually presents a spontaneous and full functional recovery. The differential diagnosis of both conditions is crucial due to the different prognosis and treatment. We herein present a

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case of IRNP in a newborn, who was initially diagnosed with BPBP.

Clinical case

The patient was a male newborn. No complications were observed during pregnancy, and he was first child of healthy parents, without any history of interest. We performed a caesarean section at 40 + 5 weeks due to non-progression (22 hours from the start of labor). Delivery is performed without instrumentation or traction of the upper limbs. The Apgar score was of 9/9/10, and the birth weight, of 3,340 g.

Upon examination, the left hand and wrist were flexed, with the thumb included in the palm. The neurological examination revealed an absence of mobility of the left upper limb at the peripheral level, with a "dropped" wrist and a slightly asymmetric Moro reflex. The grasp reflex, as well as the rest of the neurological examination, was normal. There was no irritability or pain on bone palpation. The rest of the physical examination was normal, with no data suggesting an associated pathology. With the diagnosis of BPBP, the patient was referred to the physiotherapist to start treatment.

A week later, he was referred to our center for evaluation and treatment. The physical examination showed a position of volar flexion of the wrist, the thumb in the palm, and flexion of the fingers of the left hand, with functional inability for extension (►**Figure 1**). The passive range of motion was limited for wrist extension. The patient could actively flex the elbow with full passive range of motion. Likewise, no limitation regarding active or passive mobility of the shoulder was observed. No lesions, scars, or skin indurations were observed on the upper limb. The examination did not show spasticity of the upper limb, and the bicipital reflex was symmetrical to the contralateral one. Neither did we observe congenital muscular torticollis, or alterations at the level of the hips or the feet.

The treatment began with physiotherapy, using postural guidelines, sensory stimulation, passive and subsequently active mobilization, stretching, and combined Vojta and Bobath therapies. A night brace was prescribed to keep the wrist in extension.

At six weeks, the mobility of the fingers and wrist was recovered. At two months, the patient presented complete and symmetrical mobility of the entire upper limb, and was able to extend the wrist and fingers against gravity (►**Figure 2**). Currently, the infant can hold toys with the hand with a force similar to the contralateral.

Discussion

In the newborn, IRNP, or congenital isolated radial palsy, is a rare process, with less than 100 cases published in the literature in the last 10 years.

The incidence of IRNP is unknown, as it is often confused with BPBP. Approximately 1% to 2% of the cases initially diagnosed as BPBP are actually of IRNP.[1]

The etiology of IRNP remains unknown, without a clear association with labor dystocia, as occurs with BPBP. Prolonged labor, fetal macrosomia, and oligohydramnios can cause intrauterine compression, which, in turn can causes radial nerve palsy.[2,3] In the case herein reported, the prolonged delivery could be the cause associated with the radial palsy.

The differential diagnosis between both conditions (IRNP and BPBP) in early stages is difficult, so a detailed clinical history and a complete physical examination are essential. Since it depends on the extent of nerve involvement, BPBP presents clinical variability. Classically, three types of BPBP have been defined: superior, inferior and mixed.

Involvement of the *upper* brachial plexus (C5-C6 and sometimes C7) or Erb palsy, is the most frequent, and is characterized by a position of the arm in adduction, with the shoulder in internal rotation, the wrist in flexion, and the fingers in extension (typical waiter's tip position).

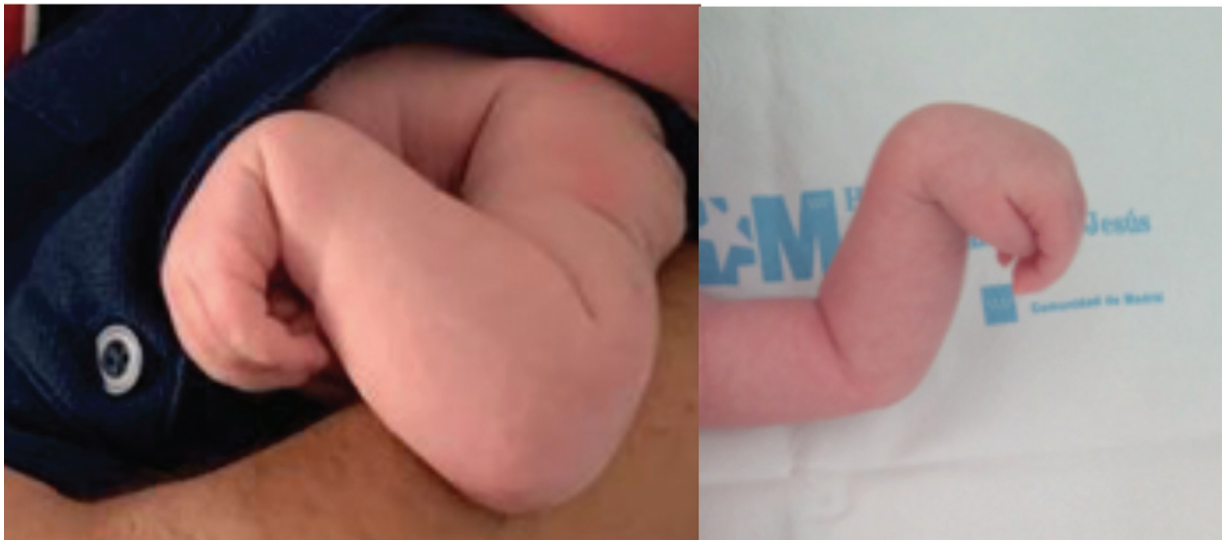

Fig. 1 Wrist and finger flexion attitude with the thumb included in the palm.

Fig. 2 Clinical appearance after two months of the physiotherapy treatment.

Lower brachial plexus injury (C8-T1), or Klumpke palsy, is characterized by a deficit in hand grip, while the proximal musculature is intact. It occurs in less than 2% of cases.

Involvement of the entire brachial plexus (*mixed*) is the second most common lesion, and the one with the worst prognosis. Patients present a flaccid upper limb and a claw hand.[4]

Clinically, IRNP is characterized by a wrist drop, with flexed fingers and thumb in palm. There is an inability for active extension of the thumb and the metacarpophalangeal joints. Normal mobility of the shoulder and elbow is characteristic. This involvement, which is mostly distal, makes diagnosis difficult and can be confused with BPBP with inferior involvement (Klumpke palsy). The way to differentiate both entities is the loss of the grasp reflex and the weakness in the grip strength of the hand, present in BPBP, but not in IRNP.[3] Likewise, the presence of an asymmetric Moro reflex, Claude-Bernard-Horner syndrome, and/or phrenic nerve palsy are characteristic of BPBP, not of IRNP.[5]

In the differential diagnosis of IRNP, other entities must also be considered, such as fractures around the shoulder, infections, neurological pathology with central nervous system (CNS) involvement, arthrogryposis with distal involvement, and amniotic band compression syndrome.

The "pseudoparalysis" that appears secondary to a *fracture around the shoulder* (clavicle, proximal humerus) is very common in complicated deliveries. It is characterized by the presence of functional limitation of the upper limb, but, unlike IRNP, in these cases, pain and irritability are observed. Imaging studies (ultrasound or conventional radiography) can help in the diagnosis. When the cause of the "pseudoparalysis" is an *infection* (septic arthritis of the shoulder, osteomyelitis), in addition to pain, local phlogotic signs and laboratory abnormalities may occur. Imaging tests (ultrasound, magnetic resonance imaging) will confirm the diagnosis in these cases. Secondary paralysis due to *neurological causes with CNS involvement* is common after a first motor neuron injury. Clinically, it is characterized by the presence of spasticity, hyperreflexia, and clonus. *Arthrogryposis* with distal involvement presents with a flexed attitude of the wrist and fingers. Unlike IRNP, which presents flexion due to flaccidity, arthrogryposis presents a deformity caused by rigid joint contractures, often associated with contractures at the proximal level (elbow and shoulder). *Amniotic band compression syndrome* can be associated with the presence of constriction bands, amputations, lymphedema, and acrosyndactyly. Characteristically, in amniotic band compression syndrome, the involvement is usually more severe and is associated with involvement of the median and/or ulnar nerves, in addition to the radial nerve.[5]

In IRNP, the presence of skin lesions has been described in up to 80% of the cases, and it is more frequent in the lateral area of the elbow. Erythema, indurations, subcutaneous fat necrosis, scars and nodules are the most frequent alterations.[1,3] Pathological anatomy studies[3,6] of these nodules reveal the appearance of fat necrosis, which is why an etiology of intrauterine compression is suggested in this process. In all cases, the skin lesions disappear over time.[6] None of the described lesions were found in our patient.

The diagnosis of IRNP is fundamentally clinical, and performing complementary tests (analytical, imaging) can help in the differential diagnosis with other clinical entities. The natural evolution is towards spontaneous resolution, in most cases, in a period shorter than six months, so initially an electrophysiological study is not indicated.[7]

In most published series, the involvement is unilateral (90%), although cases of bilateral involvement have been described, with a practically synchronous recovery.[3,5,6]

It is essential to make an adequate diagnosis and establish an early treatment. The treatment is multidisciplinary, based on observation, physiotherapy and stimulation.[3,7] In our patient, an evident clinical improvement was observed after the performance of: postural guidelines to reduce compression of the affected limb, visual and temporal stimulation, as well as the use of a night orthosis in a functional position. Passive mobilization and stretching exercises aim to improve the range of joint motion and avoid contractures. Active mobilization through the Bobath therapy is useful in these cases, as it improves functional recovery and facilitates movement through play. Neurodynamic exercises enable proprioceptive stimulation and help recover nerve function.

Vojta therapy (reflex locomotion) improves functional activity through repeated motor activation.

Brachial plexus injuries can have great variability in terms of recovery, depending on nerve involvement; however, the prognosis of IRNP is satisfactory in most cases, with complete recovery in 94% of the patients.[8,9] Therefore, the evolution of the temporal compression in IRNP is more favorable than the traction effect on the brachial plexus that occurs in BPBP.

The expected mean recovery time is of 9 weeks (range in the published series:[1–3,5,7–9] 1 to 40 weeks); in our case, complete recovery was achieved in 8 weeks.

A rare, often underdiagnosed pathology, IRNP is commonly confused with BPBP. The clinical history may include oligohydramnios, macrosomia and/or prolonged labor. The physical examination will show a wrist drop with flexion of the fingers and thumb in the palm, in the absence of contractures and with an intact proximal area (shoulder and elbow). The diagnosis is fundamentally clinical, and complementary studies must be carried out to perform a differential diagnosis with other entities. The clinical course is excellent in most cases, with complete and spontaneous recovery in up to 94% of the patients. It is important to know this pathology in order to properly guide the management of the patient and correctly inform the parents.

Conflict of Interests
The authors have no conflict of interests to declare.

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