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ORIGINAL STUDY

Evaluation of Moebius syndrome with hand manifestations

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Moebius Syndrome (MS) is characterized by congenital paralysis of the 6th and 7th cranial nerves, sometimes combined with deficits in cranial nerves and with limb anomalies. We reported that identifying common upper extremity orthopedic manifestations of this syndrome would asist physicians who care for affected patients to promtly establish a dignosis and treatment plan.

Our internal medical record system was queried and a keyword search for "Möbius/Moebius Syndrome" was conducted. The clinical data collected for each patient consisted of age at diagnosis, date of first and date of final follow-up, treatment type, treatment duration, and complications from treatment. Clinical data collected for hand and upper limb deformities included effected side, diagnosis, surgical procedures, and any post-op complications. All data was collected from radiographic images including X-ray, ultrasound, CT, and MRI imaging, and clinical, physical therapy, orthotics, and operative notes.

As regards older reports, it is realized that abnormalities in upper extremity in MS is associated with PS. We wish that this descriptive study will be helpful for those physicians who encounter this rare disease, in terms of identifying and providing timely treatment for associated upper extremity abnormalities and for assisting in counseling patients.

Keywords: Moebius Syndrome ; Poland's Syndrome ; syndactyly ; brachysyndactyly.

INTRODUCTION

In 1880, Dr. Paul Möbius first described the Möbius syndrome (MS) whose name has become attached to this syndrome, suggested in 1888 that nuclear agenesis was the pathological lesion *(14)*. MS is characterized by congenital paralysis of the 6th and 7th cranial nerves, sometimes combined with deficits in cranial nerves and with limb anomalies *(9)* (Figure 1). Facial weakness, typically bilateral, and impairment of ocular abduction are also characterized *(25)*. Since the early 1960s, it has become clear that MS might be secondary to progressive myopathic diseases, including myotonic dystrophy. The Mobius sequence consists of unilateral or bilateral facial nevre palsy and external ophthalmoplegia commonly occuring as abducens nevre paresis. The condition is usually diagnosed during the first few days of life because of the incomplete closure of the eyelids during sleep and because of the difficult nursing *(11,22)*.

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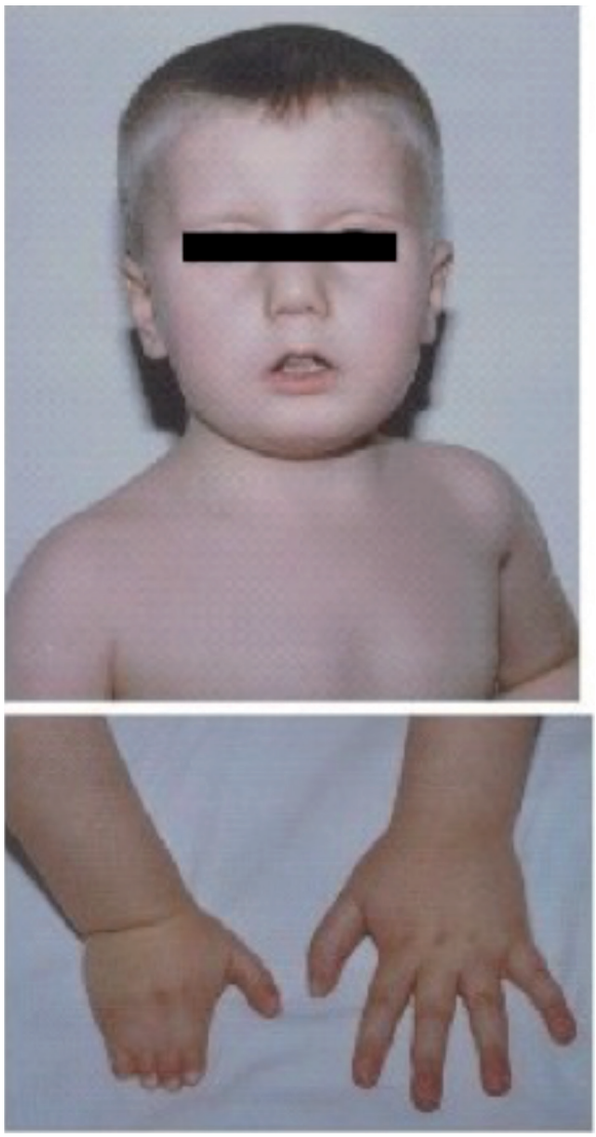

Fig.1

Facioscapulohumeral muscular dystrophy has been associated with MS and is a progressive proximal muscle disease leading to progressive weakness about the hip and shoulder *(7,10)*. Klippel-Feil, or congenital fusion of cervical vertebrae asosociation with MS has also been identified *(18,8)*.

Familial patterns have also been identified, but do not appear to contribute to a majority of cases *(4)*. A consistent etiology for the condition of MS has not been definitively found yet, though efforts continue and have shown some variation. Current hypothesis includes a vascular distruption to subclavian artery in the sixth week of embryogenesis leading to decreased arterial supply to the brain system, which also lead to spine and extremity manifestations (3, 5, 6, 8, 12, 15, 19, 21, 23, 24, 26). A specific and consistent genetic abnormality has not been clearly identified,

Congenital hand differences and Poland's Syndrome (PS) are also present in higher frequency. There is no system for categorizing the various anomolies, designing treatment protocol, or assessing therapeutic results in Möbius syndrome with upper extremity problems. In current study, we reported that identifying common upper extremity orthopedic manifestations of this syndrome would asist physicians who care for affected patients to promtly establish a dignosis and treatment plan.

MATERIALS AND METHODS

This was an IRB approved single institution retrospective review of all patients diagnosed with MS from 1980-2015. Our internal medical record system was queried and a keyword search for "Möbius/Moebius Syndrome" was conducted. Patients were then screened for inclusion and exclusion (no clear diagnosis of MS) criteria.

The clinical data collected for each patient consisted of age at diagnosis, date of first and date of final follow-up, treatment type, treatment duration, and complications from treatment. For patients with a co-morbid upper limb disorder was recorded.

Clinical data collected for hand and upper limb deformities included effected side, diagnosis, surgical procedures, and any post-op complications. Finally, any other diagnosed syndrome and related treatment was recorded. All data was collected from radiographic images including X-ray, ultrasound, CT, and MRI imaging, and clinical, physical therapy, orthotics, and operative notes.

RESULTS

An initial medical record query yielded a list of 65 potential patients with MS. After a thorough review, 21 patients were excluded due to a lack

of clear diagnosis of MS. This left us with 44 (23 female and 21 male) patients to include in our review.

Sixteen patients were diagnosed with a upper limb disorder. There were three patients with a diagnosis of a hand deformity/condition other than PS. One patient was diagnosed with snydactyly, one with symbrachydactyly, and one with an absent digit on the left and syndactyly on the right hand. No surgery was needed for any of these patients.

Nine cases of PS were identified based on absence of the pectoralis tendon in the axillary fold. One patient had no hand abnormality, three had syndactyly, three had symbrachydactyly, and two patients had a dual diagnosis of syndactyly and symbrachydactyly. Five patients were effected on the right side, and four on the left. Six patients with PS had surgery for syndactyly release. There was no revision needed for these patients. Three syndactyly patients had also clubfoot deformity. One of those three patients had surgery for his foot deformity, other 2 patients were treated with casting for their foot deformity.

Two patients had multiple upper extremity contractures. One patient had multiple surgeries including bilateral humerus supracondylar osteotomy, carpal wedge osteotomy, and soft tissue procedure.

Rarely common diagnose included transverse deficiency and shoulder deformity. One patient had bilateral upper limb deficiency, and one had bilateral shoulder deformity without any hand disorder.

Four patients had syndromes concomitant with MS. These syndromes included Arthrogryposis, Pullman syndrome with two patients, Attention Deficit Hyperactive Disorder (ADHD).

DISCUSSION

Richard and Baraitser emphasize that primary abnormalities of the extremities and trunk are essential features of MS, in addition to facial diplegia and abducens palsies *(23,24)*. MS has been identified to have multiple orthopaedic associations within the plastic surgery literature *(9,17,1)*. The association of the MS and the PS occurs with sufficient frequency that the combination probably represents a formal genesis malformation syndrome of unknown etiology. Both syndromes have been associated with a large number of other anomalies. The PS consists of unilateral absence of sternocostal head of the pectoralis major muscle, in the majority of patients, syndactyly, brachydactyly, and hypoplasia of the hand. Variants of Poland sequence can present as isolated absence of pectoralis major muscle and breast hypoplasia without limb defects *(20)*. Recently there have been numerous reports describing a combination of the two syndromes in individual patients.

A previous attempt has been made to more specifically delineate the orthopedic manifestations of MS, but the data was of low scientific validity *(13)*. Congenital hand differences and PS are also present in higher frequency. Fascioscapulohumeral muscular dystrophy has been associated with MS, and is a progressive proximal muscle disease leading to progressive weakness about the hip and shoulder *(7,10)*. An association with Klippel-fiel, or congenital fusion of cervical vertebrae, has also been identified *(18,8)*. With regard to associated malformations, many descriptions have been made of the sporadic association with Poland anomaly or with anomalies of the limbs.

Mobius sequence is usually sporadic. There are reports of family cases, generally without associated anomalies. When present, these consist of limb defects and mental retardation, which has a low incidence in familial cases.

While the etiology of MS has yet to be definitively elucidated, numerous promising theories have been reported which may explain the high association with orthopaedic pathology *(3,5,8,23,25)*.

Previously the largest series, a retrospective review in the literature, included only 27 patients. Of these patients, 5 were diagnosed with scoliosis (18.5%), 10 with lower limb deformity including clubfoot (2, 7.4%) flatfoot (1, 3.7%) metatarsus adductus (1), valgus (2), peroneal nerve deficiency (1) and congenital amputation (2), three patients with syndactyly of the toes, and 10 with upper extremity differences including missing digits (4), syndactyly (1) radial aplasia (1), short humerus (1) hypoplastic radius/ulna (1) brachydactyly (1) and clinodactyly (1) *(1)*.

To our best of knowledge, the manifestations of Möbius Synfrome specifically in upper extremity has never been described. A recent publication supported high rates of clubfoot, scoliosis, Poland syndrome, and transverse limb deformities *(13)*. Our purpose in this study to report the largest single series of patients who had Möbius syndrome either with or without Poland syndrome and the only single institution series in the literature with upper limb problems. We identified sixteen patients diagnosed MS with upper extremity problems. Nine patients with PS had high frequency for required surgical treatment. Only two patients of nine patients with combined MS and PS did not need surgery for their hand problems. However, the patients had only MS diagnosis did not need any surgery for their hand problems. In this large series, this data made us to consider hand problems in MS without PS did not require surgery, and PS was the main factor to be required surgical treatment. Isolated MS with hand disorders can be tolerated well with patient not to decreased hand motion ability that makes fine motor skills. Difficulty with upper extremity use appears related to the hand disorders and decreased hand motion ability that makes fine motor skills particularly difficult for MS when it is related with PS. Our study reports a higher incidence of syndactyly, symbrachydactyly which may be due to decreased likelihood of reporting of these conditions in the craniofacial setting. In these individuals, hand problems were the most prevalent. A usually high incidence of syndactyly and symbrachydactyly was noted. The incidence is so high that we felt a diagnosis of MS should be considered whenever either syndactyly or symbrachydactyly is present. All patients were severe enough to warrant surgical interventions. Of the patients who had surgical treatment, there was no recurrence in all and no revisions were required. Patients upper limb problems are a significant part of MS, and individuals with these problems should be evaluated and followed-up regularly by an orthopaedist who is specialized in hand.

CONCLUSION

The most consistent weakness in the previously reported cases was the lack of a complete and accurate report for upper limb problems in MS. As regards older reports, it is realized that abnormalities in upper extremity in MS is associated with PS. Evaluation of our single institutional case series, upper limb abnormalities can occur in MS without association of the Poland Syndrome. This series of patients with MS represents the largest series of patients in the literature with the incidence of upper extremity problems in the syndrome. We wish that this descriptive study will be helpful for those physicians who encounter this rare disease, in terms of identifying and providing timely treatment for associated upper extremity abnormalities and for assisting in counseling patients.

Conflicts of Interest: No conflicts declared..

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