CASE REPORT

Comprehensive Rehabilitation and Assistive Device Intervention in an Untreated Quadrilateral Limb Deformity: a case report

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INTRODUCTION

Limb reduction refers to the shortening or total absence of a limb or specific segment of a limb. The prevalence of congenital limb reduction is 4.48 per 10,000 live births. (1) Congenital defects of the upper limb are the most common form of limb reduction defects, as they constitute 58.5% of all cases. (2)

There are two broad categories of congenital limb defects, transverse, and longitudinal. Transverse deficiencies are more common than longitudinal ones, and they involve the absence of all parts of a limb distal to a certain level. These can be associated with amniotic band sequence or genetic syndromes such as Adams-Oliver syndrome. Longitudinal deficiencies on the other hand affect the long axis of a limb and can affect one bone predominantly. Deficiencies of the radius are the most common type of transverse deficiencies. These are often due to genetic causes or associated with other anomalies, such as Trisomy 18. Hypoplasia or aplasia of several bones can also be seen in longitudinal deficiencies. Most longitudinal deficiencies are thought to be due to de novo mutations or due to exposure to teratogen in pregnancy. (3)

CASE REPORT

A 14-year-old boy presented to the OPD of the department of physical medicine and rehabilitation with deformities of all the four limbs. He was having transverse deficiency of the right upper limb and longitudinal deficiency of all other limbs.

On examination the shoulder joint was bilaterally normal in terms of range of motion and power. On the right side the forearm and hand were absent and on the left there was restriction of pronation and supination at the elbow. In the left wrist there was restriction of ulnar and radial deviation and except for the thumb all other digits were absent [Figure 1]. In the lower limbs, hips were normal, knee on right there was a 20-degree extension deficit and the left knee was fixed around 80 degrees of flexion. Legs were short with a length of eight and four inches respectively with two digits on right and one on left [Figure 2]. There were callosities and hyperpigmentation over both knees and foot due to altered gait pattern [Figure 3]. No deficits in strength were noted in the hip and it was not possible to assess in knee and foot due to deformity.

There was no history of any similar illness in the family. The child was born to non-consanguineous marriage and it was a full-term delivery. The family gave a history of the father attempting to take his life and abandoning him and his mother after his birth. He found salvation through his maternal father who assumed responsibility for his upbringing. Despite the profound adversities and hardships, this boy is independent in all his activities of daily living and has demonstrated remarkable resilience and intellectual capacity. He is studying in seventh grade with exceptional academic aptitude, fighting all his barriers with determination.

Figure 1: transverse deficiency of right and longitudinal deficiency of left upper limb

Figure 2: Transverse deficiency of lower limbs with hyperpigmentation and callosities

Figure 3: patients ambulation pattern

Rehabilitation Approach

Enhancing functional independence was the goal of rehabilitation. The multidisciplinary team advised him well fitted orthosis for better wait bearing and ambulation. Occupational therapy involved adaptive training for improving his ability to do activities of daily living and to prevent overuse injuries. He was counselled regarding the importance of having UDID and the benefits. He was introduced to assistive devices and mobile based learning in order to facilitate academic participation.

Discussion

Congenital limb deficiencies are shortening or total absence of limb or segments of limb. Even with the availability of rehabilitation programmes, these deformities often go neglected. Here the patient is 14 years and he has never been exposed to a rehabilitation programme. It indicates a large gap between the rehabilitation services and rural parts of our country. The child is continuously walking on his knees and he sustains recurrent injuries to the skin and it can increase as the child's age advances.

Providing him with properly fitted orthosis [Figure 4] can improve his gait parameters, as well as confidence and will prevent him from getting multiple injuries as his age advances. Even if the child is independent in all of his ADLs, Assistive devices also form an integral component of multidisciplinary rehabilitation. Beyond orthotic and prosthetic devices, the use of adaptive tools and communication aids can significantly enhance functional outcome. Improving Accessibility can significantly enhance his education and thereby functional outcomes. Integration of low-cost assistive devices can bridge the gap between impairment and participation in resource limited settings. His integration into mainstream education represents a significant achievement, yet requires ongoing support systems and advocacy to ensure equal participation. As he continues to develop, the interplay between societal acceptance, personal resilience, and appropriate accommodations will be critical in determining his long-term social integration outcomes. This

case highlights the importance of supportive, reassuring and encouraging family structures, inclusive and integrated educational environments, and disability-positive social attitudes in enabling children with multiple physical challenges to achieve their optimum potential Enrolling him into UDID will provide him with financial assistance and extended opportunities to achieve his optimum potential.

Figure 4: patient with preliminary orthosis

CONCLUSION

Congenital limb deficiencies are often neglected and mostly remain outside of the reach of the rehabilitation services in the developing world. Providing proper rehabilitation and early introduction of assistive technology will help them to come into the mainstreams of society and will improve their quality of life.

AUTHORS CONTRIBUTION

SB: conceptualisation, literature review Manuscript drafting, manuscript revision, final approval. **SMP**: literature review Manuscript drafting, manuscript revision, final approval. **GY**: literature review Manuscript drafting, manuscript revision, final approval. **PD:** Manuscript drafting, manuscript revision, final approval

CONFLICT OF INTEREST

There are no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

No AI tools has been used in the formation of the article

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