Case Report

Physical Therapy Management for Child with Generalized Joint Hypermobility

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Abstract

The purpose of this case report is to provide insight regarding the screening and early physical therapy interventions for a child with Generalized joint hypermobility (GJH). The increased mobility in joints than the normal range of movement in one joint is referred to as Hypermobility. The Hypermobility occurring in more than one joint is referred to as Generalized Joint Hypermobility (GJH). GJH is usually benign (asymptomatic) however, over time may lead to joint pain and developmental delay. Identifying the GJH at the school-age would facilitate to monitor early changes and to plan for early rehabilitative intervention. This case report describes the clinical findings of a 7-year-old primary school male student with GJH. This patient scored 9 points in the Beighton score. The preliminary physical therapy sessions were targeted to improve joint protection, joint control, and stability. The long-term goals were injury prevention and physical fitness.

Key words:

Case report, Children, Hypermobility, Physical therapy, Ligament laxity, Joint protection, Joint control, Proprioception.

الملخص

الغرض من تلك الدراسة هو تقديم نظرة ثاقبة فيما يتعلق بالفرز والتدخلات العلاجية المبكرة للطفل المصاب بفرط الحركة فى المفصل (GJH). يشار إلى زيادة الحركة في المفاصل عن المعدل الطبيعي للحركة في مفصل واحد أو أكثر باسم الحركة المفرطة (Hypermobility) ، أما بالنسبة إلى التي تحدث في أكثر من مفصل واحد باسم حركة مفرطة عامة (Generalized Joint Hypermobility)) عادة ما يكون حميداً (بدون أعراض) ، ومع مرور الوقت قد يؤدي إلى آلام المفاصل وتأخر النمو. تحديد GJH في سن المدرسة من شأنه أن يسهل لرصد التغييرات المبكرة والتخطيط للتدخل التأهيلي المبكر. يصف تقرير الحالة هذا النتائج السريرية لطالب يبلغ من العمر ٧ سنوات في مدرسة ابتدائية مصاب بفرط الحركة في المفصل (GJH). هذا المريض سجل ٩ نقاط في مقياس Beighton. استهدفت جلسات العلاج البدني الأولية لتحسين حماية المفاصل ، والسيطرة على المفاصل والاستقرار. وكانت الأهداف طويلة الأجل الوقاية من الإصابة واللياقة البدنية.

الكلمات الدالة:

تقرير حالة ، الأطفال ، فرط الحركة ، العلاج الطبيعي ، تراخي الرباط ، حماية المفاصل ، التحكم في المفصل ، التحسس.

Introduction

The increased mobility in joints than the normal range of movement in one joint is referred to as Hypermobility. Hypermobility occurring in more than one joint is referred to as Generalized Joint Hypermobility (GJH) [1]. Ligamentous laxity is a major cause of hypermobility of the Joint. The occurrence of GJH in children of age group 6–15 years differ between 8.8% and 64.6% [2,3]. GJH is more common in females and declines with an increase in age. Earlier researchers demonstrated an influence of ethnic background on GJH. There is a high prevalence of GJH among Asian and African populations compared to the Western population [2]. Yet literature is scarce regarding the prevalence of GJH among children in the Gulf region.

Beighton score is a valid and reliable measure to screen the Joint hypermobility and widely used across the globe. Beighton score assesses hypermobility in 9 joints such as right and left thumbs, right and left small fingers, right and left elbows, left and right knees and body trunk. The score ranges from value of 0 to value of 9, one point awarded when the subject can perform each of the 9 tasks. All 9 tasks were easy to perform and provide quantitative data. The common choice of cut off score was ≥ 4 for GJH [2]. Juul et al and Smits-Engelsman et al recommended standard protocols to be administered in children [1].

GJH is usually benign (asymptomatic) However, over time may lead to joint pain and developmental delay. Identifying the GJH at the school-age would facilitate to monitor early changes [4] and to plan for early rehabilitative intervention. The purpose of this case report is to provide insight regarding the screening and early intervention aiming at joint protection and injury prevention of children with generalized joint hypermobility.

Case Report

The patient was a 7-year old male Grade 1 student at a primary school in the Majmaah region, Saudi Arabia. The patient was evaluated by the Physical therapist during a School Health Screening Program after obtaining consent from the child, parents and school authorities. The anthropometric data like height, weight and arm span were 114 cm, 20.2 kg, and 117 cm respectively. The body mass index was 15.5 (underweight) and the Arm span / Height ratio was 1.02. The patient was screened for Marfanoid habitus features like Steinberg and Walker–Murdoch sign.

For eliciting Steinberg or the thumb sign, the subject should fold his thumb into a closed fist. And this test is considered positive if the tip of the thumb extends from the palm. The Walker–Murdoch sign or the wrist sign could be obtained by instructing the subject to grip his wrist by using thumb and little finger of the other hand. Overlapping of the thumb and little finger is considered positive for this test [5]. Both Steinberg and Walker–Murdoch sign was found to be negative and Arm span / Height ratio of 1.02 also falls in the normal range.

The child was screened for GJH using the Beighton score. The components and the scoring criteria of the Beighton score are as follows.

1. Extension of metacarpophalangeal joint of the little finger. The range of motion (ROM) of ≥ 90^0 is considered positive. (Maximum 2 Points – 1 point for each side).
2. Hyperextension of the elbow. The range of motion (ROM) of ≥ 10^0 is considered positive. (Maximum 2 Points – 1 point for each side).
3. Hyperextension of the knee. The range of motion (ROM) of ≥ 10^0 is considered positive. (Maximum 2 Points – 1 point for each side).

4. Passive opposition of the thumb to the flexor aspect of the forearm. The test is positive if the entire lateral border of the thumb touches the anterior surface of the forearm. (Maximum 2 Points – 1 point for each side).

5. Forward flexion of the trunk with knees in extension. The test is positive if the palmar aspect of the entire hands touches the floor. (1 Point).

The Beighton score ranges from 0 to 9 and the score of ≥ 4 is widely used cutoff for classifying as generalized joint hypermobility.

The subject in this case report scored positive bilaterally in the little fingers (2 Points), thumbs (2 Points), elbows (2 Points), knees (2 Points) and trunk (1 Point). Hence, the total score is found to be 9 and classified as a case of generalized joint hypermobility (Figure 1-4). However, he did not exhibit any additional characteristics as specified in Brighton's criteria like arthralgia, back pain, dislocation or subluxation, soft tissue rheumatism (eg: epicondylitis, tenosynovitis, bursitis) marfanoid habitus (arm span / height ratio < 1.03, positive Steinberg / wrist signs) abnormal skin (eg: striae, hyperextensibility, thin skin, papyraceous scarring), eye signs (eg: drooping eyelids, myopia or antimongoloid slant), varicose veins or hernia or rectal prolapse to be diagnosed as Hypermobility syndrome [6].

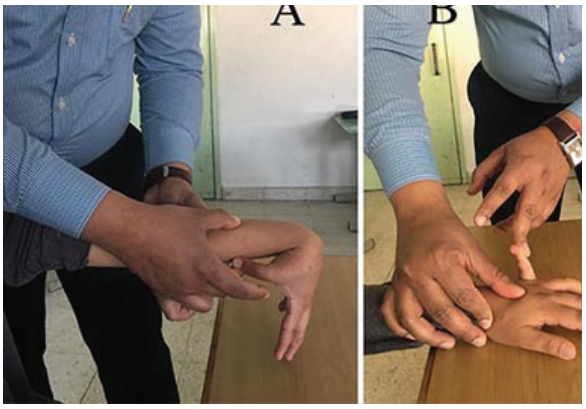

Figure 1(A) *Passive opposition of the Thumb to Flexor aspect of the forearm,* ***(B)*** *Passive dorsiflexion of little finger beyond 10^0*

Figure 2 *Hyperextension of elbow beyond 10^0*

Figure 3 *Hyperextension of Knee beyond 10^0*

Figure 4 *Forward flexion of the trunk with knees extended so that the palms of the hand rested on the floor*

The interventions focused on patient education, joint protection, enhancing balance, coordination, proprioception, muscle strength, functional stability, and kinetic control of symptomatic joints. The condition was explained as noninflammatory and non-progressive connective tissue disorder to the child in the presence of parents and physical educator. Regarding joint protection, the child was advised to refrain from any contact sports activities and not to stretch the joints beyond the end range of motion during the daily and recreational activities.

The functional stability and kinetic control of symptomatic joints were trained by teaching the child to control neutral joint position. The child was oriented to regarding abnormal resting position and avoids it (Eg: to avoid knee hyperextension while standing). The postural muscles were retrained to regain optimal joint alignment. Once the neutral joint position was achieved, dynamic control was performed by retraining the spinal muscle to maintain a neutral spine while moving adjacent joints (Eg: hip flexion while maintaining the spine in neutral). Motion control was achieved by enhancing the ability of the specific muscles to control the joint through the entire range both concentrically and eccentrically (Eg: quadriceps working concentrically during standing up and eccentrically while sitting down). Functional stability and kinetic control exercises were performed 20 -30 slow repetitions per session. The patient was trained for 6 weeks (3 sessions per week) supervised by the Physical therapist.

The tight muscles like hamstrings were stretched after adequate postural control was attained. The initial phase of proprioceptive training included exercises like unilateral stance, mini squats, and single-leg knee bend and later progressed to advanced activities like wobble board balance exercises. The patient underwent 12 sessions of proprioceptive and balance activities lasting for 15 minutes each, over a period of 4 weeks. Finally, the child performed standardized general exercises to improve muscle strength and fitness activities like shuttle-run, step-up and sitting to standing. Initially, each fitness exercises were repeated 10 times during each session and progressed with an increment of 5 repetitions. These fitness activities were performed during the physical education period under

the supervision of the physical educator. The child did not develop any musculoskeletal injury at 6 weeks follow up.

Discussion

This case report describes the clinical findings of a primary school male student with GJH. The hypermobility is more common in younger children as seen in this current case scenario. This patient did not exhibit any associated clinical features of hypermobility related genetic disorders such as Ehler- Danlos syndrome or Marfan's syndrome. However, he did not exhibit any symptoms of musculoskeletal disorders or other additional characteristics as specified in Brighton's criteria to be diagnosed as Hypermobility syndrome [6]. This patient is underweight as reflected by BMI of 15.5 Kg/m^2. Earlier researches did not report any significant association between BMI and GJH [2].

The patient was screened for the presence of joint hypermobility using the Beighton score (BS). The BS was developed in South Africa and was based on 1,083 Tswana Africans (adults and children) and subsequently used globally to identify generalized joint hypermobility in all populations and age groups. The BS is influenced by age, gender, and ethnicity. In adults, the cutoff of $\geq 4/9$ is used to classify hypermobility. But there is no consensus regarding the cutoff for children [2]. The BS score of this patient was 9/9 and classified as Hypermobile.

It is essential to screen the children for issues related to hypermobility to start the exercise interventions at the earliest to prevent devastating complications. The hypermobile children tend to adopt the end joint range during resting position to gain stability. This faulty resting position along with features like abnormal movement patterns, decreased proprioception causes supporting joint structures to undergo excessive stress and strain resulting in fatigue and pain [7]. Pain reduces the joint mobility and leads to weakness of the surrounding muscles and result in joint injuries and musculoskeletal disorders [7-9]. The hypermobile individual commonly experience ankle sprains and functional ankle instability followed by anterior cruciate ligament (ACL) injury and shoulder instability (subluxation or dislocation) [10]. The healing period for hypermobile individuals was longer compared to the normal population and result in deconditioning [7].

Physical therapy plays an integral role in the management of joint hypermobility. The preliminary physical therapy sessions were targeted to reduce pain and improve joint protection, joint control, and stability. The long-term goals were injury prevention and physical fitness. This patient did not experience any pain and hence focused on other mentioned interventions. This patient was advised to refrain from contact sports as a measure of joint protection because participation in contact sports increases the risk of joint injuries in hypermobile individuals.

The interventions on joint control focused to

maintain the normal range of movement with an emphasis on attaining effective control of the entire range of movement, especially in the hypermobile range as recommended in the literature. The objective of the joint control exercises was to retrain tonic low threshold activation of the local stability system to enhance muscle stiffness and train the functional low load integration of the local and global stabilizer muscles to regulate the neutral position of the joints [11]. In a recent school-based study in UK, Hand physical therapy significantly improved grip strength among Hypermobile children. The grip strength of this patient was found to be in the normal range [12-14].

The ideal amalgamation of proprioception and motor control is essential for normal movement. Proprioception is the ability to sense the position of the joint (position sense) and movement (kinesthesia) for the sake to guarantee the optimal joint position and acquire adequate muscle tone for the specific activity [15]. Earlier researchers reported proprioceptive deficits among hypermobile individuals and the reason for this is still not clear. The proprioceptive exercises performed by this patient effectively improved joint stability in addition to proprioception and were highly recommended in the literature [7].

Once effective joint control is accomplished, hypermobile individuals are motivated to create a lifelong dedication to physical activity to preserve excellent health and well-being. It is imperative to identify safe and entertaining activities and sports which could maintain adequate cardiopulmonary fitness [7]. We plan to advise him to take part in swimming activities during the next follow-up.

Conclusion

This case report discusses a pediatric patient with GJH. The screening and early rehabilitation strategies for joint hypermobility were discussed to start the exercise interventions at the earliest to prevent devastating complications. The preliminary physical therapy sessions were targeted to improve joint protection, joint control, and stability. The long-term goals were injury prevention and physical fitness. There is a scarcity of research focusing on the effectiveness of Physical therapy in the management of GJH. Hence, further studies are essential to agree or contradict the treatment strategies mentioned in this case report.

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