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Knee walking – a toddler's clever adaptation?

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Educational objectives

Presenting problem: Swollen knees in a 16 month toddler

Diagnosis: Soft tissue swelling and callus formation around the knees

Cause: Prolonged knee walking

But why? To answer

1. Required a full developmental history – normal milestones, first steps at 11 months
2. Required:

a. Full developmental and neurological examination – normal findings, neurologically intact, full and free movement of both knees

b. Exploration of child's environment – daily attendance at crèche, all activities at floor level, minimal outdoor activities

c. Pathogenesis of knee walking - ? adaptation of bright toddler to her daily environment

Management

Encouragement of activities both indoor and outdoor

Change of crèche with better facilities

Outcome

Rapid progression to upright walking did away the need for physiotherapy

Spin-off – increased core strength from prolonged knee walking

Lessons learnt

1. Importance of taking a full developmental history and examination when seeing any child
2. Reaching a diagnosis raises concerns about its causation
3. Further exploration requires a review of the child's environment
4. Knee walking may arise not only as an intermediate stage between crawling and walking, nor its persistence only occurring in neurologically damaged children or those with hypotonia, muscle weakness or contractures, but also in normal toddlers who unknowingly adapt to get the most out of their environment.

Asking the question: Why a black Swan? Allows clinicians to explore unusual observations in their clinical practice and to share their experience with like-minded colleagues – adds to the excitement of clinical practice

Abstract

A 16 month old toddler presented with swollen knees which on examination related to soft tissue trauma as a result of continued knee walking. Despite taking her first few steps 5 months earlier, that evolved to increasing competence in knee walking, allowing her to whiz around a room. That persisted for many months despite being developmentally normal and neurologically intact. She did not have features suggestive of a myopathy, or a hypermobility syndrome with hypotonia. She was alert and responsive with no suggestion of autism. Exploration of her environment found that for 7 hours per day she attended a crèche where all activities were carried out on the floor or on low tables. Even the adult carers sat on the floor. Upright walking only followed once the toddler spent more time outdoors where she was encouraged to walk there being little need for physiotherapy intervention. A change of the crèche further fostered that improvement. Persistent knee walking in a normal toddler may be a clever adaptation of a bright child to best benefit from the environment she was placed in.

"O" aged 16 months presented with swelling around both knees associated with roughness of the overlying skin and callous formation (Figure 1). She was otherwise well. She was developmentally normal and neurologically intact. No other joints were affected. She had no history of fever or rash. There was no lymphadenopathy, splenomegaly or any other features suggestive of a systemic disorder. Her muscle tone and power were normal. There were no contractures or joint anomalies. She was bright and responsive with good eye contact unlike findings suggestive of autism spectrum disorder.

Figure 1 Swollen knees.

She attended a crèche and apart from the intercurrent upper respiratory infections, was well. Of note she took her first tentative steps when aged 11 months and said the odd word then, being spoken to in two languages. "O" subsequently took to knee walking and was able to rapidly move around a room on her knees (Figure 2).

Figure 2 Knee walking.

Knee walking had been described as an intervening stage between crawling and walking independently.[1,2] It helps build up core strength prior to independently taking the first few steps. "O" was developmentally normal with no abnormal neurological signs. Yet she continued to move around on both knees, often excited and smiling in the process. Why was this so? Why had she not progressed to walking normally having taken her first few steps some 5 months earlier?

Exploring the set-up at the crèche, which she attended for 5½ days per week, the room where she spent most of her time was relatively small for the number of children present. In addition everything was set-up at knee level – the tables, the toys, and the activities. Even the adult carers sat on the floor (Figure 3). To facilitate movement around the room and to take advantage of the various toys and participate in the class activities, walking on the knees appeared to be the most efficient way for "O" to get around. Unfortunately she continued to knee walk everywhere – at home despite it being more spacious, in the playground where she knee walked on the grass or the painful gravel.

Figure 3 Set up in crèche "O" attended.

It took many months for "O" to regain and progress her walking skills. To encourage her to walk she was frequently taken out to the surrounding gardens and playgrounds and initially assisted by holding her hand. She gradually realised that walking would get her from one place to the next as quickly as her knee walking, and was indeed less painful. Physiotherapy may well have hastened the acquisition of upright walking.[3,4] However the above simple measures of taking her outdoors to play and holding her hand led to her once again walking and then running.

"O" has since been enrolled in another crèche with more space and outdoor playing areas. One positive outcome of her prolonged knee walking was the buildup of her core strength as evidenced by her ability to scale up a slide doing away with the need to use its steps (Figure 4).

Figure 4 Climbing up a slide demonstrating excellent core strength acquired from her prolonged knee walking.

Discussion

Knee walking is frequently described as a possible intermediate step between crawling and walking.[2] Many children's hospitals websites describe the relative benign nature of knee walking which generally progresses to upright walking. It is also well documented in parenting websites where similarly affected families reassure those concerned that their toddler or child is knee walking but is otherwise normal, suggesting patience and/or the involvement of a physiotherapist.[4] Knee walking may be a manifestation of the normal variability in early walking patterns.[5] It also may signify a delay in upright walking as a feature of neuromuscular immaturity.[6] It is well described in neuromuscular disorders as a compensatory pattern where there is proximal muscle weakness.[7,8] It may also occur as a result of lower limb malalignment, hypotonia or habitual compensation for a

painful joint and/or localized weakness. It has also been described as a feature of hypermobility syndrome though a review of paediatric affected patients did not report a case[9,10]. Of more serious concern are those children with neurological deficits particularly involving the lower limbs, which may result in the development and persistence of knee walking.[11]

"O" was developmentally normal, if anything advanced for her age as observed in her other milestones. She did not have any abnormal neurological signs. Yet she "chose" to knee walk to get around. Was that indeed a clever adaptation to the environment in which she spent most of her time during the week? Just as infants and young children exposed to one or more languages assimilate the words and nuances of the languages spoken, developing an increasing understanding of what is being said and then assimilating that experience followed by speaking the language,[12] it may be that "O" in some way adapted to the environment that she was placed in to get the most out of it as suggested by Hoch et al.[13]

Further reports of similar occurences may provide additional support for this observation. If so, it draws attention to the importance of providing appropriate facilities for infants and children as they progress from crawling to walking.

Conclusion

Persistent knee walking in a normal toddler may be a clever adaptation of a bright child to gain most from the environment she was placed in.

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Conflict of interest

None declared.

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