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AN UNUSUAL PRESENTATION OF A CHILD WITH A LIMP IN PRIMARY CARE

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ABSTRACT

An adolescent patient visited his general practitioner with acute and severe pain in his left thigh and calf. The pain worsened with walking and was unresponsive to analgesia. He had a history of cellulitis in the left foot and a strong family history of deep vein thrombosis and pulmonary embolism. He was initially treated for cellulitis and discharged home. Doppler ultrasound revealed obstructive plaques in the femoral and posterior tibial arteries, confirming arterial thrombosis at the third clinical encounter. An echocardiogram revealed vegetation on the mitral valve, indicating endocarditis. Further investigations ruled out autoimmune causes. The patient was treated with anticoagulants, antibiotics, and surgically. This case underscores the importance of considering

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uncommon causes and conducting comprehensive evaluations when faced with a child presenting with a limp.

KEYWORDS: *Limping Child, Thrombosis, Primary care*

1. Introduction

Limping child can be a presentation to general practice that is encountered infrequently with a wide list of differential diagnosis. Experts have tried to facilitate diagnosis through systematic approaches based on age ranges or validated tools focused on musculoskeletal and infective causes (Mohamud, Durrant and Birahinduka, 2021). However Femoral Artery Thrombosis is not commonly listed in the differential diagnosis. An appropriate vascular assessment could aid prompt diagnosis and avoid delays in treatment.

2. Case presentation

An adolescent patient presented to his General Practitioner (GP) with a one-day history of severe sharp pain in the left leg. This was localized to the left calf and thigh. There was no history of trauma. He did not have any recent fevers, coryzal symptoms or other limb or joint pains. Pain was aggravated by walking, which caused a limp. There was no improvement of the pain despite analgesia.

Past medical history included cellulitis in the left foot five months prior to this encounter which was treated abroad with oral antibiotics for ten days. There

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was also a strong family history of deep vein thrombosis (DVT) and pulmonary embolism (PE) in his mother and maternal aunt.

On examination, there was an antalgic gait with normal range of movement in the hips, knees, and ankles bilaterally. There were no visible swelling, varicosities, erythema, or colour changes, however there was marked tenderness in the left calf and thigh despite distraction techniques. The patient was referred subsequently to the accident and emergency department of the local hospital.

In the Emergency Department patient had investigations including normal x-rays of the left leg and blood tests which showed a high C-reactive protein (CRP) (22 mg/L), neutrophilia ($11.3x10^9$/L) raised white cell count ($14.3x10^9$/L) and elevated creatine kinase (446 IU/L; normal range 30–200 U/L). The patient was discharged on oral antibiotics with a clinical impression of cellulitis and was advised to be reviewed if there was no improvement within 48 hours. However, he returned to the Emergency Department with severe unremitting pain and was admitted for further investigations shortly after.

Investigations

Upon admission, repeat blood tests showed rising CRP (30 mg/L) and rising Creatine Kinase (669 IU/L) with improvements in the neutrophilia ($8.3x10^9$/L) and white cell count ($12.2x10^9$/L). Haemoglobin (116 g/L) and platelets ($273x10^9$/L) were normal.

An urgent doppler ultrasound showed an obstructive atheromatous plaque of 13mm length noted at the proximal end of the deep femoral artery. A similar

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near-obstructive plaque of 29mm length was noted in the mid portion of the posterior tibial artery. Following these findings, a further arterial doppler ultrasound was performed the day after which showed the profunda femoris artery was occluded and calcification at its origin with faint doppler flow detected distally. Superficial femoral artery was patent with a large, mobile arterial thrombus seen attached at the posterior wall of its origin which appeared unstable.

Multiple blood cultures were taken, of which one grew gram positive cocci in pairs and clusters. However, this was felt to be a contaminated sample. Electrocardiogram demonstrated prolonged corrected QT interval (QTc) of 567 milliseconds.

After the ultrasound doppler indicated arterial thrombosis, further investigations were conducted to determine the source of the thrombosis. A soft systolic murmur was detected during the cardiac examination, prompting a bedside echocardiogram. This revealed the presence of echogenic lesions measuring 0.6x0.7 cm on the anterior mitral valve leaflet, resulting in mitral regurgitation. There was good visual systolic function. Subsequently, the patient was transferred to a tertiary hospital for a repeat echocardiogram, which confirmed the presence of a round, homogeneous, and echo-bright structure that was more pronounced on the anterior mitral valve leaflet which was suspected to be a vegetation.

Thereafter, further tests and reviews were undertaken by the infectious diseases, rheumatology, and haematology teams. Infectious mononucleosis screen was negative, erythrocyte sedimentation rate was mildly elevated at 16 mm/h

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(normal 1-12 mm/h). Complement C3 and C4 were normal at 1.60 g/L and 0.32g/L, respectively. Anticardiolipin IgG (9.5 GPLU/mL) and Cardiolipin Immunoglobulin M antibody (2.2 MPLU/mL) were within normal ranges suggesting low probability of autoimmune causes.

A subsequent ultrasound arterial Doppler examination revealed an abnormal dilation of approximately 1.00cm in the origin/proximal section of the profunda femoris artery. The vessel appeared heavily calcified with a thickened wall and showed a patent "stump" occlusion, while the remaining portion of the vessel was completely blocked and almost non-existent.

3. Differential Diagnosis

Many possible differential diagnoses were taken into consideration for the cause of this acute limp. Musculoskeletal, congenital dysplasia, infective arthritis, trauma, and myositis. These were excluded through history, examination and investigations as listed above (Adamson and Waterfield, 2019).

After ultrasonography showed femoral artery thrombosis and mitral valve vegetation, infective and non-infective causes of endocarditis were considered including systemic causes like systemic lupus erythematosus (SLE) and Takayasu's Arteritis (TA). An infrequent cardiac manifestation of systemic lupus erythematosus called Libman-Sacks endocarditis (LSE) can be easily confused with infective endocarditis, particularly among children with a normal heart structure (Al Riyami et al., 2022; Hurrell, Roberts-Thomson and Prendergast, 2020). Takayasu's arteritis is a chronic inflammatory disease that

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primarily affects the large blood vessels and can lead to thickening, fibrosis, and narrowing of the vessel walls. It can be misdiagnosed as infective endocarditis due to the presence of a murmur and fever during the active phase of the disease (Alcelik et al., 2011).

4. Treatment

Patient was initially reviewed by the vascular surgical team and commenced on treatment dose of Enoxaparin with further investigations for the source of the embolus. Subsequently he was commenced on intravenous (IV) antibiotics (Tazocin and Vancomycin) for suspected Infective Endocarditis. Unfortunately, he developed tachycardia and pruritus due to Vancomycin after six days of treatment and was switched to IV Ceftriaxone. Nadolol was initiated for the prolonged QTc.

5. Methodology

A literature review was carried out on paediatric femoral artery stenosis and the assessment of paediatric limp in order to establish up to date assessment tools or reports of similar clinical presentations. Therefore, a comprehensive search was conducted using various academic search engines and databases including PubMed, Google Scholar, ScienceDirect, and the Cochrane Library, focusing on studies published from 2009 onwards. These platforms were selected for their extensive and reputable repositories of peer-reviewed medical literature. Examples of keywords used were: "paediatric femoral artery stenosis," "paediatric limp assessment," "vascular abnormalities children," “ femoral

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artery thrombosis" and "limp differential diagnosis paediatric". This was to ensure a thorough retrieval of relevant studies. Inclusion criteria were set to filter studies that specifically addressed the diagnosis, management, outcomes, and case reports of paediatric femoral artery stenosis, as well as comprehensive reviews and clinical assessments of limping in children. Articles not meeting these criteria, such as those focusing on adult populations or unrelated vascular conditions, were excluded. The gathered literature was reviewed to identify common clinical presentations, diagnostic approaches aiming to provide a robust foundation for understanding and managing a limp in paediatric patients.

6. **Discussion**

7.1 General challenges for Primary Care Physicians when assessing a child with a limp

Given the broad list of potential causes, it may be challenging to reach a straightforward diagnosis in a limping child. There are many suggestions in the literature arguing for a thorough clinical evaluation where experts offered various assessment tools (Mohamud, Durrant and Birahinduka, 2021) or systematic approaches (Santili et al., 2009) to overcome this diagnostic challenge. Common approaches include risk stratification by age range, history of presentation and pattern of gait abnormality. Therefore, it is important to evaluate fully the possibilities of traumatic and non-traumatic causes of a limp.

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An initial detailed but focused history taking could guide the clinician towards the subsequent appropriate investigations and management. This should include age, history of any recent trauma or history of previous non-traumatic limp, presence of fever or other systemic symptoms (i.e., weight loss, night sweats), preceding coryzal symptoms, bleeding, bruises, bone pains at night. Common differential diagnosis in limping children with systemic symptoms would include Perthes disease, septic arthritis/osteomyelitis, juvenile inflammatory arthritis (JIA), neoplasm (Mohamud, Durrant and Birahinduka, 2021).

Causes of a limp in a child could be divided according to the age at presentation. This age based systematic approach could allow prompt investigations and increase the likelihood of early diagnosis. Certain pathologies like transient synovitis, septic arthritis, neurological disorders (cerebral palsy (CP) and muscular dystrophy), developmental dysplasia of the hip (DDH), coxa vara, juvenile rheumatoid arthritis (JRA), and neoplasms (osteoid osteoma, leukaemia) tend to be more prevalent in the toddlers, whereas, Perthes disease, discoid meniscus, inferior limbs discrepancy and non-specific muscular pain can also affect children of school age. Lastly, slipped capital femoral epiphysis, congenital hip dislocation, chondrolysis, overuse syndromes, dissecans osteochondritis, and tarsal coalition can be more prevalent in adolescents (Santili et al., 2009).

Some experts suggest that a paediatric Gait Arms Legs Spine (pGALS) assessment tool could be used by non-specialist as a simple quick musculoskeletal assessment to distinguish abnormal from normal joints in children of school age (Foster and Jandial, 2013). However, despite the broad range of differentials covered by these classification and assessment tools, they

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do not include vascular conditions as potential causes. Examination of leg pulses are not included in the examination checklist.

While femoral artery occlusion (FAO) remains a frequent complication after paediatric cardiac catheterisation or blunt trauma, it is exceptionally rare in the general paediatric population (Kim et al., 2016). Due to its uncommon occurrence in children, FAO might not have been included as part of the age-based differentials, and pulse checks are not emphasized in the pGALS (Paediatric Gait, Arms, Legs, and Spine) assessment (CKS, 2023; Foster and Jandial, 2013). Consequently, there is a high likelihood of it being overlooked, leading to a delayed diagnosis.

Additionally, in this specific case parental concerns regarding recurring cellulitis and presence of mildly raised inflammatory markers may have played a significant role as confounding factors leading to delayed diagnosis.

Evidence in literature suggests primary care physicians face several challenges when diagnosing children with non-specific symptoms. Experts have highlighted the need for systematic assessment tools and thorough evaluation to avoid overlooking uncommon causes(Sarkar et al., 2012; Marshall et al., 2022). There are various examples of case reports and assessment tools in the literature for children with a limp. However, there are no specific case reports on limping children due to femoral artery thrombosis, in particular, following endocarditis. Some assessment tools do not even include arterial thrombosis as part of the differential diagnosis of a limping child. Therefore this case report will hopefully draw clinicians' attention on broader differential diagnostic options

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and promote a more comprehensive assessment including the importance of limb pulses examination.

7.2 Main lessons identified

The correct cause of the limp in this patient was identified only during the third clinical encounter, highlighting an important consideration for clinicians in primary care. It serves as a reminder that certain cases involving a child's limp may not immediately reveal an apparent cause. Nevertheless, this should not diminish the significance of the symptoms, but rather prompt clinicians to escalate the situation appropriately for further investigations in instances where diagnostic uncertainty arises.

When evaluating a patient's medical history, it is crucial to consider the identified risk factors during clinical decision-making. For example, in the case of this child, the presence of a significant family history of DVT and PE should have alerted the clinicians to consider thrombosis as a potential aetiology at an earlier stage of assessment.

Furthermore, as the utilisation of remote consultations in primary care continues to rise, it is crucial for clinicians to maintain a cautious approach when evaluating children who present with a limp or leg pain. Assessing such cases in person should be prioritised, as there is a risk of overlooking severe limb circulation pathologies when conducting remote assessments. To ensure comprehensive care, healthcare systems should establish protocols enabling patient care coordinators to directly schedule face-to-face consultations for children who present with a limp.

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In addition, it is crucial for clinicians to conduct a comprehensive evaluation of limbs, paying close attention to pulses and capillary refill times. This is especially important when there are communication barriers, such as with young children, patients with learning disabilities, or those who face language barriers. By adopting this approach, clinicians can ensure a thorough assessment and minimise the risk of overlooking a diagnosis or near misses.

7. Conclusion

In conclusion, the case of the teenage boy with a sudden onset of severe leg pain highlights the importance of thorough evaluation and consideration of multiple differential diagnoses in cases of limping children. Despite the initial non-specific presentation, the persistence of severe symptoms and the presence of risk factors such as a family history of DVT and PE warranted further investigation. Delayed diagnosis of femoral artery thrombosis emphasizes the need for clinicians to maintain a high level of suspicion and to explore all possible causes when confronted with atypical presentations. This case highlights the significance of risk factor assessment, comprehensive examination, and timely referral for appropriate investigations to ensure accurate diagnosis and appropriate management. It serves as a reminder for clinicians to remain vigilant and consider uncommon aetiologies in the evaluation of a child with a limp.

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