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Limping Gait *in Children*

Limping gait is defined as deviation from normal gait resulting in an asymmetrical walking pattern. Limping gait also means, the stance phase on the affected limb is shorter than normal side. They tend to off load they weight as soon as possible to the normal side. It can be mild, self-limiting or a sign of serious illness that may even lead to limb and life threatening condition. Therefore, appropriate attention should be given if your child is limping. A thorough history and physical examination by a clinician are the first step in achieving the goal and early identification of underlying cause of limping gait. The need for ancillary investigations is based on the history and clinical evaluation to aid or confirm the diagnosis.

There are many ways to classify the causes of limping gait. Generally it can be divided into 2 major categories: Inflammatory or infectious disorder and non-inflammatory (such as congenital, trauma, metabolic and malignancies). The purpose of this write-up is to emphasize on the infectious causes which, if identified and treated earlier can prevent more serious sequela such as limb or even life threatening conditions.

Mechanical	Inflammatory	Infection	Specific hip disorder
• Strain / sprain • Fracture - Toddler fracture • Overuse syndrome	• Reactive arthritis • Juvenile RA • Connective tissue disease	• OM / Septic arthritis • Soft tissue infection • Abdominal sepsis • Lymphadenitis	• Perthe's disease • SCFE
Congenital	**Malignant**	**Metabolic**	**Others**
• DDH • CTEV • Skeletal dysplasia	• Leukemia • Bone tumor • Spinal cord tumor	• Ricket	• Hematological disease • Osteochondritis dissecans • Neuromuscular disease

Table 1: Causes of limping gait

Birth - 5 years old	Infection - OM, septic arthritis Mechanical - NAI, toddler's fracture Congenital - DDH, CTEV Juvenile idiopathic arthritis (JIA) Neurological / neuromuscular disorder
5-10 years old	Mechanical - overuse injury Reactive arthritis JIA Malignancy Perthe's disease
10-16 years old	Mechanical SCFE JIA Malignancy

Table 2: Age specific diagnosis

Transient synovitis

It is the most common cause of lower extremity pain and likely responsible for the majority of the cases of limping due to irritable joint. Children aged 4-8 years old are commonly affected with high prevelance towards male. It usually manifest as rapid onset of hip pain with limited range of motion and limping gait. Plus, it often preceded by history of viral infections. Although the clinical presentation may mimic septic athritis, but patient rarely have temperature higher than 38 degree and usually not toxic looking . Laboratory results such as white cell count (WBC), erythrocytes sendimentation rate (ESR), C-reactive protein usually are within normal range and radiological imaging are remarkable. Ultrasound may show effusion of the joint which is associated with transient synovitis. The mainstay treatment is conservative with brief period of bedrest and non-weight bearing ambulation the use of oral nonsteroidal antiinflammatory drugs. Light traction during bedrest maybe beneficial. Patients are advisable to use crutches during ambulation until limp subsided. Clinically symptoms usually resolves gradually in days to weeks (average 10 days) and the long term outcome is generally favourable.

Septic arthritis

Septic athritis requires urgent medical attention as delay of treatment can lead to significant joint destruction. The presentation are acute, and child walking with a limp and refuse to weight bear due to pain. It usually progresses to febrile illnesses and they often associated with other systemic symptoms causing toxic appearance. On clinical examination, the affected joint will appear swollen, erythematous and tender. The hip will held in flexed, abducted and externally rotated as the hip capsular volume is maximum in this position. The range of motion is very limited and sometime they may present with pseudoparalysis.

It is crucial to check for other joint involvement as septic athritis is haematogenous spread and they may involve more than one joint. Kocher and associates introduced an evidence-based clinical prediction algorithm in 1999 that differentiated between septic

arthritis and transient synovitis of the hip. Four clinical predictors were used: refusal to weight beat, history of fever, ESR more than 40 mL/hr, and serum WBC count of more than 12,000 cells/mL. The probability of septic arthritis ranged as high as 99.1% if all four criteria are present. Joint aspiration is indicated when there is high suspicion of infection. The aspirate WBC count is > 50 000/mm3 with more than 75% polymorphonuclear leukocytes. However, in the earlier stage , lower cell count may occasionally present as the cell count is on the rise. Gram stain is important to determine the appropriate initial antimicrobial agents.

Commonly, the synovial fluid is culture positive, unless patient has recently taken antibiotics. Staphylococcus aureus is the most common organism associated with septic athritis. Emergency athrotomy and washout is the standard care for almost all septic joints except for adolescent Neisseria Genorrhea infection which can be treated with high dose penicilin alone. The common sequale for septic athritis are completet femoral head destruction, physeal damage which lead to angular deformity and limb length discrepency, joint contractures and growth disturbance.

FIGURE 1: 18 months old child which was diagnosed as right hip septic athritis .A: increased joint space with increased density of ossific nucleus. B: 5 months later ossific nuclues had resorbed. C: at 11 years 7 months patient came with sequale of septic athritis and shortening of right limb 3.5cm

Osteomylitis

Osteomyelitis is common in the first decade of life due to rich metaphyseal blood supply and immature immune systems. It is 2.5 times more common in boys and typically affects the metaphyseal region via hematogenous seeding. S.aureus continues to be the most common offending organism. The presentation varies with age, toddlers and children may present with acute symptoms such as localised swelling, pain and pseudoparalysis and may be associated with high grade fever and appears toxic. Meanwhile, adolescent may be more indolent resulting in delay in diagnosis. In early cases, radiological imaging maybe normal. Destruction of bone, usually metaphyseal can be appreciated until several days has passed.

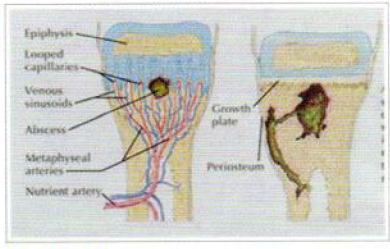

FIGURE 2: Terminal branch of metaphyseal artery form loops at growth plate and enter venous sinusoids, Blood flow slowed and tuberlent predisposing to bacterial seeding. Abscess limited by growth plate. In infant under 1 year old, metaphyseal arterial branches pass through growth plate an infection may invade epiphysis and joint.

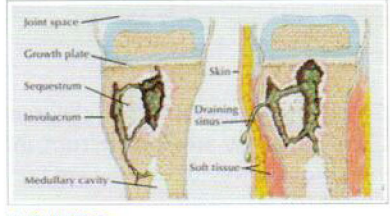

FIGURE 3: As abscess spread, devitalized bone (sequestrum) remains within it.Elevated periosteum may lay down bone to form involucrum. Occasionally, abscess is walled off by fibrosis and form Brodie's abscess. Infectious process may progress and lead to chronic sinus.

CONCLUSION

Limping gait is a common presentation in children and in many cases it is the result of self-limiting process in otherwise healthy child. However, limping maybe the presentation of sinister underlying pathology. As such, a detail clinical evaluation, judicious use of appropriate investigations and potential input from paediatric subspeciality and multidisciplinary team to maximize the chance of a positive outcome and return to normal function is necessary. PH