

Diagnostic Dilemmas and Treatment Strategy for Paediatric Non-Traumatic Knee Effusion

Dhawal Bakhda^{1*} and Kirti Raju²¹Specialist Orthopaedic Surgeon, Aster Hospital Mankhool, Dubai, UAE²Specialist Rheumatologist, Aster Hospital Mankhool, Dubai, UAE***Corresponding Author:** Dhawal Bakhda, Specialist Orthopaedic Surgeon, Aster Hospital Mankhool, Dubai, UAE

DOI: 10.31080/ASOR.2023.06.0713

Received: February 15, 2023**Published:** March 06, 2023© All rights are reserved by **Dhawal Bakhda and Kirti Raju**.**Abstract**

Knee effusion in paediatric age group is usually due to hemarthrosis following an injury. However, there are several non-traumatic causes of knee effusion found in the paediatric age group. Evaluation and treatment for non-traumatic effusion in knee requires special attention. This is desired basically to differentiate between infectious, post-infectious, rheumatologic, hematologic, vasculitis and malignant diseases. Despite knee swelling prevailing in ~27% of general population, there is lack of consensus on diagnosis and management of this condition among Indians. The present case highlights the importance of a definite diagnostic pyramid and multidisciplinary approach required for early diagnosis and treatment of non-traumatic knee effusion in an adolescent with underlying juvenile spondyloarthropathy.

Keywords: Knee Effusion; Juvenile Spondyloarthropathy; Adalimumab; TNF-Alpha**Introduction**

A knee effusion is defined as presence of increased volume of fluid in the synovial compartment of the knee which is the most common pathological finding in the synovial diseases of knee. It can occur due to traumatic as well as non-traumatic causes [1]. The later includes tumour, crystal deposition, degenerative arthritis, inflammatory arthritis, or infection [2,3]. Effusion of joints is more common among elderly due to degenerative arthritis as compared to younger populations as the wear-and-tear damage doesn't get compensated in later age. In most cases, non-traumatic knee effusion is found to be an early sign of osteoarthritis [3]. Knee joint is more frequently injured than other sites, owing to its weight-bearing nature and lack of congruity-building structures as that present around ankle or hip joints. The lifetime prevalence of knee swelling is reported in up to 27% of general population; infants and teenagers being most often affected among pediatric group [4]. There is dearth of adequate epidemiological data on knee effusion in paediatric population, from the Indian subcontinent. Here, we report an interesting case of an adolescent with knee effusion presented as a diagnostic dilemma.

Case Description

A 16-year-old boy presented to our out-patient department of Orthopaedics with chief complaints of pain, and swelling in his left

knee with a single episode of fever. Development of swelling was sudden, non-traumatic, and had appeared 2.5 months ago along with a single episode of fever since the previous day. The haematological investigations revealed a T cell count of $9.81 \times 10^3/\mu\text{L}$, C-reactive protein (CRP) 48 mg/dL, and serum uric acid levels of 6.3 mg/dL with normal rheumatoid arthritis factor, and normal knee x-ray. However, within 1 week of presentation there was a sudden onset of pain in right knee and ankle.

To arrive at a definitive diagnosis and appropriate management after ruling out inflammatory causes, a series of investigations were performed. The left knee synovial fluid aspiration test performed on second presentation reported no bacteria or pus cell on gram staining and no growth on culture. On the same day, HLA B27, anti-CCP (cyclic citrullinated peptide), Quantiferon for tuberculosis results was reported to be negative and with higher CRP levels of 136 mg/dL. Fluid examination of knee aspirate showed a cell count of 50 cell/ μL with protein content >6 . Magnetic resonance imaging (MRI) of the knee revealed generalized thickening of the synovium with stranding showing hypo-intensity in T1T2W images. Minimal knee joint effusion was identified along with significant subarticular bone marrow edema/osteitis noted in the tibia, femur, and patella. Heterogeneous hyper intensity was also observed in Hoffa's fat pad fluid-sensitive images and minimal anterior extrusion of the

anterior horn of the medial meniscus was also present. Articular cartilage did not reveal any evidence of erosion and the articular capsule appeared intact. No evidence of osteochondral lesion was seen. MRI features were suggestive of significant synovitis secondary to inflammatory arthritis. Septic arthritis was unlikely considered since there was no cartilage erosion. The patient underwent arthroscopic synovial biopsy with synovectomy and lavage of the left knee. Figure 1 depicts extensive synovial hypertrophy in anterior compartment knee.

Histopathology of the synovial tissue of the left knee revealed fragments of fibro-collagenous tissue with scattered fragments of synovial tissue and focal hyperplastic synovial tissue with sub synovial tissue showing moderately dense and diffuse predominantly lymphoplasmacytic and histiocytic inflammatory infiltrate admixed with focal neutrophilic infiltrates (Figure 3). There was no evidence of well-defined epithelioid granuloma, fungal organisms, pannus formation, crystals, or malignancy in the sections examined. These findings confirmed the presence of chronic synovitis. In due course after surgery patient developed pain in both Sacroiliac joints and lower back left elbow and left hand. Post Histopathological report patient underwent MRI Sacroiliac joint to rule out Juvenile Spondyloarthritis. MRI Sacroiliac joint showed features of sacroiliitis on right side. Following the histopathological, radiological, and microscopic examinations, the final diagnosis of juvenile spondyloarthritis was made following Rheumatologist opinion and the patient was started on adalimumab injection 40mg once in 2 weeks. The BASDAI Score (Bath Ankylosing Spondylitis Disease Activity Index) before starting Inj Adalimumab injection was 6.4. In due course of this treatment, the patient had involvement of multiple joints including the right knee, left ankle, wrist, left elbow, left hand, and sacroiliac joints in absence of any episode of inflammation in skin, eye or gut. With due of course of treatment over 6 months with Inj Adalimumab the BASDAI disease index improved with inflammatory markers CRP and ESR returning to normal.

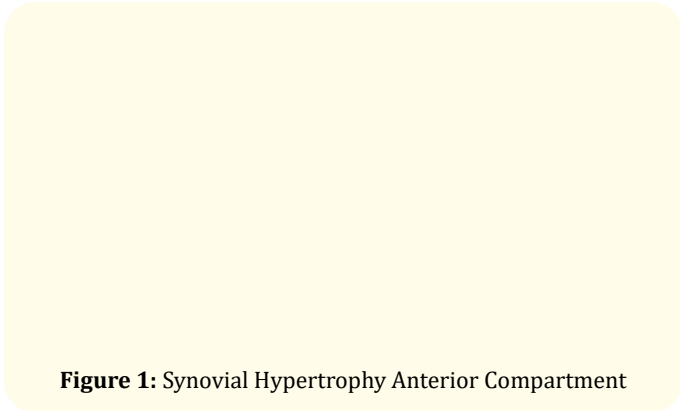


Figure 1: Synovial Hypertrophy Anterior Compartment

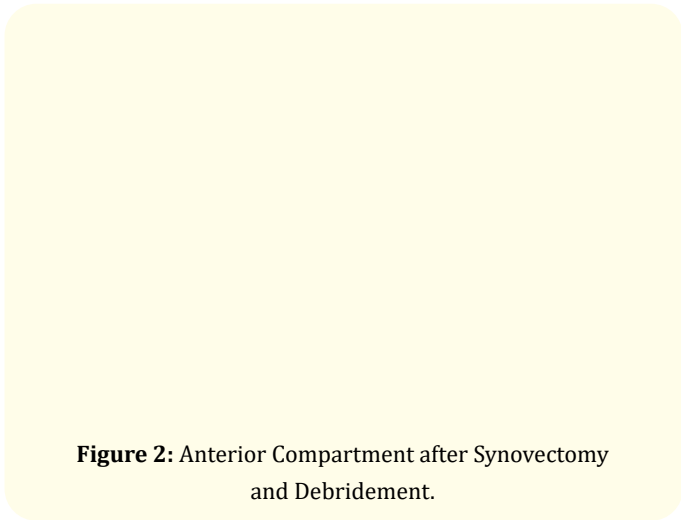


Figure 2: Anterior Compartment after Synovectomy and Debridement.

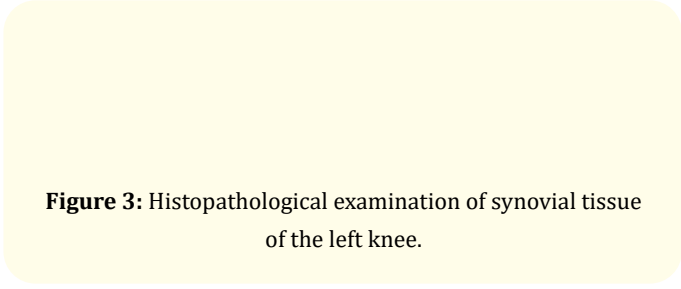


Figure 3: Histopathological examination of synovial tissue of the left knee.

Discussion

Knee effusion is a common finding among patients with pre-existing knee problems though not always presenting with swollen knee. The confirmatory diagnosis necessitates employment of ultrasonography, MRI, circumferential comparison of the size of both knees and water displacement volumetry to assess limb volume [3]. In contrast to adult-onset spondyloarthritis (SpA), sacroiliitis is a rare phenomenon among children [5]. However, sacroiliitis was observed in our patient, which makes this case an atypical presentation of juvenile SpA.

Another distinction of this case is non-infectious aetiology unlike most published reports on knee effusion in this age group [6]. Understanding of the causative pathology is key to correct diagnosis and treatment planning in patients with knee effusion.⁷ Knee aspiration is recommended to be done at the earliest to rule out septic arthritis and is conclusive in majority of the cases. Where knee aspiration is inconclusive, radiological evaluation and a high index of suspicion for non-infective-rheumatologic causes of knee effusion and the monoarticular onset of disease are essential. Arthroscopic synovial biopsy and synovectomy are required in such cases to get tissue diagnosis and reduce the inflammatory tissue load [8].

Axial involvement is reported in about 30% of children within 15 months of diagnosis of juvenile SpA. The use of tumour necrosis factor- α (TNF- α) inhibitors to slow syndesmophyte growth and axial progression in AS remains controversial among the experts. While continuous use of non-steroidal anti-inflammatory drugs (NSAIDs) has been shown to slow radiographic progression, the effect is small [9]. TNF- α inhibitors are recommended for patients with active sacroiliac disease who have received an adequate trial of NSAIDs and have high disease severity.

Our patient responded well to adalimumab, which is in line with the findings of previously published reports of effectiveness in paediatric age group [10,11]. The expanding evidence emphasizes that the standard and synthetic Disease Modifying Anti-Rheumatic Drugs (DMARDs) are not sufficient to diminish the disease course, making earlier implementation of biological DMARDs more valuable in improving both clinical and patient-reported outcomes in the HLA-B27 population [12].

Conclusion

Comprehensive evaluation and timely intervention with adalimumab treatment has prevented functional deformity in knee joint. Timely initiation of disease modifying anti-rheumatoid drugs, (especially the biologics like adalimumab) can prevent the damage, deformity and disability in knee effusion cases of arthritic origin. The case highlights the importance of multidisciplinary approach in the condition and demonstrates that coordinated efforts of the orthopaedic and rheumatology specialists can bring in excellent outcomes benefiting patients.

Conflict of Interest

Author has no conflict of interests to declare.

Funding

None.

Bibliography

1. Li TY. "Sonography of Knee Effusion." *Journal of Diagnostic Medical Sonography* 36.6 (2020): 545-558.
2. Vanaskova E., et al. "Malignant Knee Joint Effusion-A New Dimension of Laboratory Diagnostics". *Applied Sciences* 12.3 (2022): 994.
3. Swe M., et al. "Detection of Non-Traumatic Knee Effusion among Asymptomatic Individual with Different type of Lifestyle and Selected Sociodemographic Factors Using Fluid Shift Test and Ultrasonography". *Journal of Arthritis* 7.2 (2018): 1-5.
4. Baker P., et al. "Knee disorders in the general population and their relation to occupation". *Occupational and Environmental Medicine* 60.10 (2003): 794-797.
5. Burgos-Vargas R., et al. "Juvenile-onset spondyloarthropathies". *Rheumatic Disease Clinics of North America* 23.3 (1997): 569-598.
6. Chandrasekaran AN., et al. "Spectrum of clinical and immunological features of systemic rheumatic disorders in a referral hospital in south India: Primary ankylosing spondylitis". *Journal of Indian Rheumatology Association* 2.4 (1994): 149-152.
7. Johnson MW. "Acute knee effusions: a systematic approach to diagnosis". *American Family Physician* 61.8 (2000): 2391.
8. Gupte C., et al. "The acute swollen knee: diagnosis and management". *Journal of the Royal Society of Medicine* 106.7 (2013): 259-268.
9. Johnsson H., et al. "Synovial biopsies in clinical practice and research: current developments and perspectives". *Clinical Rheumatology* 40.7 (2021): 2593-600.
10. Ramanathan A., et al. "Update on juvenile spondyloarthritis". *Rheumatic Disease Clinics* 39.4 (2013): 767-788.
11. Sulpice M., et al. "Efficacy and safety of TNF α antagonist therapy in patients with juvenile spondyloarthropathies". *Joint Bone Spine* 76.1 (2009) :24-27.
12. Callhoff J., et al. "Efficacy of TNF α blockers in patients with ankylosing spondylitis and non-radiographic axial spondyloarthritis: a meta-analysis". *Annals of the Rheumatic Diseases* 74.6 (2015): 1241-1248.