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Subacute Femoral Neck Osteomyelitis with Torpid Evolution and Undiagnosed at the Onset: Chronic Pain and Pathological Bone Fracture: A Case Study

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Background: Chronic pain is a persistent and among most prevalence issue in childhood the bio psychosocial model of pain which is a complex interplay contributes to pain symptoms. Disability has guided our understanding and treatment of pediatric pain. The exact cause of chronic pain is sometimes infectious.
Introduction: The inclusion of chronic pain and rehabilitation terms resulted in a search to treat pediatric pain, treatment requires a comprehension and multi-disciplinary approaches mostly relieved by psychological intervention. Currently it is unclear how accurate diagnosis is made by general practitioners and specialists and how evaluation is made by pain specialists can affect patient's outcomes.
Case: A young adult female whose chronic hip and knee pain from several months was treated for pain, and osteoporosis, and osteomalacia, with calcium supplements, once Magnetic resonance imaging was done, it revealed that the patient is having fluid filled space in left hip when biopsied revealed chronic osteomyelitis.
Conclusion: Chronic pain in pediatrics may be associated to osteomalacia, or osteopenia, it may be infectious, may be due to malignancy or fracture, but it shall be investigated with MRI na biopsy if the pain persists and not reliving with analgesics and supplements. Ignorance of chronic osteomyelitis can have poor outcomes.

Keywords: Pediatric pain; chronic pain; chronic osteomyelitis; Staph aureus; MRSA.

1. INTRODUCTION

"Osteomyelitis is defined as an infection of the bone and can be associated with adjacent soft tissue or intra-articular joint infections" [1]. "The metaphysis is the most common location of osteomyelitis in the pediatric population, followed by the diaphysis and rarely the epiphysis. The reasoning for this is due to the vascular anatomy of skeletally immature bone. Both the metaphysis and diaphysis are fed by the same nutrient arteries while the epiphysis has an independent vascular supply; after approximately 12-18 months of age, no transphyseal anastomoses remain. The sinusoidal lakes connecting the arterial and venous systems within the bone are low flow areas that allow for the potential accumulation of microorganisms" [2]. "The most common pain included in childhood is migraine, musculoskeletal and abdominal pain. The presence of pain has a negative effect on the social, academic and family domain of the child. The pain can be due to chronic osteomyelitis and its causes are staph aureus, group B strep, kingella, pseudomonas, H influenza, Mycobacterium TB, salmonella, viral and Fungal" [1].

The investigations include Complete blood profile, ESR, CRP, Blood and pus culture, MRI or bone scan sometimes [3]. "It can cause some major complications like sepsis, bone fracture, meningitis, DVT, growth disturbance and septic arthritis. X-rays can show osseous changes in the setting of chronic osteomyelitis, but MRI remains the most critical imaging modality. Little literature exists regarding the optimal treatment strategy for chronic osteomyelitis; however, the gold standard includes aggressive surgical debridement followed by 4-6 weeks of antibiotic therapy. The most common complications include abscess, fistula, and sinus tract formation" [4]. "Results of culture and sensitivity should guide antibiotic treatment if possible, but in the absence of this data, it is reasonable to start empiric antibiotics. A commonly used broad-spectrum empiric antibiotic regimen against both gram-positive and negative organisms, including MRSA, is vancomycin (15 mg/kg intravenously [IV] every 12 hours) plus a third a generation cephalosporin (e.g., ceftriaxone 2 gm IV daily) or a beta-lactam/beta-lactamase inhibitor combination (e.g., piperacillin/tazobactam 3.375 IV every 8 hours)" [5].

The treatment includes antibiotics, surgical debridement and drainage of pus and involucrum.

Epidemiology: "Osteomyelitis within the pediatric population is a rare condition with a reported annual incidence of 3-20 per 100,000 children, with the majority of these cases representing acute osteomyelitis. Pediatric osteomyelitis is approximately twice as common in males compared to females" [6]. Interestingly, Pacific Islanders have a well-reported greater incidence and severity of osteomyelitis.

2. CASE PRESENTATION

A 13-year-old female came to our hospital with a history of fever, right shoulder pain, and left hip and knee pain that had been ongoing for the past 6 months. The patient had visited multiple hospitals for these complaints. According to her mother, she used to go to school regularly, but the severe hip and knee pain had made it difficult for her to walk. Upon examination, wasting of the knee muscles was observed, but the rest of the joints appeared normal with no signs of inflammation. After admission to our department, blood tests were conducted. The results showed a white blood cell count of $15.6x10^3$ /ul, with 82.4% neutrophils, and a C-reactive protein level of 114 mg/dl. The patient's Anti-CCP antibodies were within the normal range at 8 U/mL, and her PTH-intact level was also normal at 14.6 pg/mL. However, her ferritin level was high at 670 ng/mL. Her 25 Hydroxyvitamin D level was within the optimal range at 44.8 ng/mL. Thyroid function tests and blood coagulation profile were unremarkable. Urine and blood cultures were taken before starting antibiotics, and the results were negative. The brucella antibodies were tested to rule out Brucellosis, and the results came back negative. A serum protein electrophoresis was performed and it revealed moderate hypoalbuminemia, along with an increase in the alpha and beta fractions. A pelvic ultrasound was conducted to check for an abscess, but it showed no abnormalities. Additionally, a Urine R/E test was done and it also did not show any remarkable findings. Ophthalmology was consulted and a fundoscopy was performed, which turned out to be normal. An X-ray of the hip revealed evidence of an old fracture in the neck of the femur. Further imaging through an MRI of the pelvis and both hips showed a soft tissue mass in the left femoral head and neck, along with a pathological femoral neck fracture and a small hematoma. Abnormal signals were also observed in the medial femoral condyle. The mycobacterium tuberculosis culture was requested, but the results came back negative. To further investigate, a histopathology left hip biopsy was performed, which surprisingly revealed chronic osteomyelitis with abscess formation. Culture revealed Staph Aureus. In response, the patient was prescribed IV antibiotics, leading to a noticeable improvement in her symptoms. The orthopedic surgery department was consulted to address the fracture, which was then successfully repaired. During a recent follow-up appointment, the patient reported being free of symptoms and showed signs of improvement.

Table 1. Pathological report

Name of investigation	Results	Normal Range	Unit
Hemoglobin	**4.5mg/dl**	M=14-18 F= 11.7-15.7	mg/dl
W.B.C	**15.5**	4-11	$x10^3$/dl
Neutrophils	80%	40-70%	$x10^3$/dL
Lymphocytes	11%	20-25%	$x10^3$/dL
Monocytes	5%	2-10%	$x10^3$/dL
Eosinophil	2%	1-2%	$x10^3$/dL
Platelets Count	280000	150-400	$x10^6$/L
Sodium	137	136-149	mmol/L
Potassium	**3.2**	3.8-5.2	mmol/L
Chloride	98	98-107	mmol/L
Random Blood Sugar	110	80-140	mg/dl
Blood Urea	27	10-50	mg/dl
Alkaline Phosphatase	79	40-129	mg/dl
Serum Calcium (Total)	9.3	8.8-12.0	mg/dl
Total Bilirubin	**0.9**	0.1-1	mg/dl

Name of investigation	Results	Normal Range	Unit
Creatinine kinase	61	10-120	micrograms per liter (mcg/L)
ANF	**Negative**	negative	
ESR	**60**	0 to 15 mm/hr in men. 0 to 20 mm/hr in women	mm/hr
Ferritin	**670**	Male: 30 to 400 nanograms per milliliter (ng/mL) Female: 13 to 150 ng/mL	ng/mL
CRP	**114**	0.3 to 1.0	mg/dL
LDH	188	**140 to 280**	**U/L**
Anti CCP	8	less than 20 Units	
Urine R/E	Normal	looking for any nitrates and WBC, RBC and PH most of the time or amt sediments	
Serum procalcitonin	0.95ng/ml	less than 0.1	ng/mL

2.1 All Investigations

Hip joint X ray:

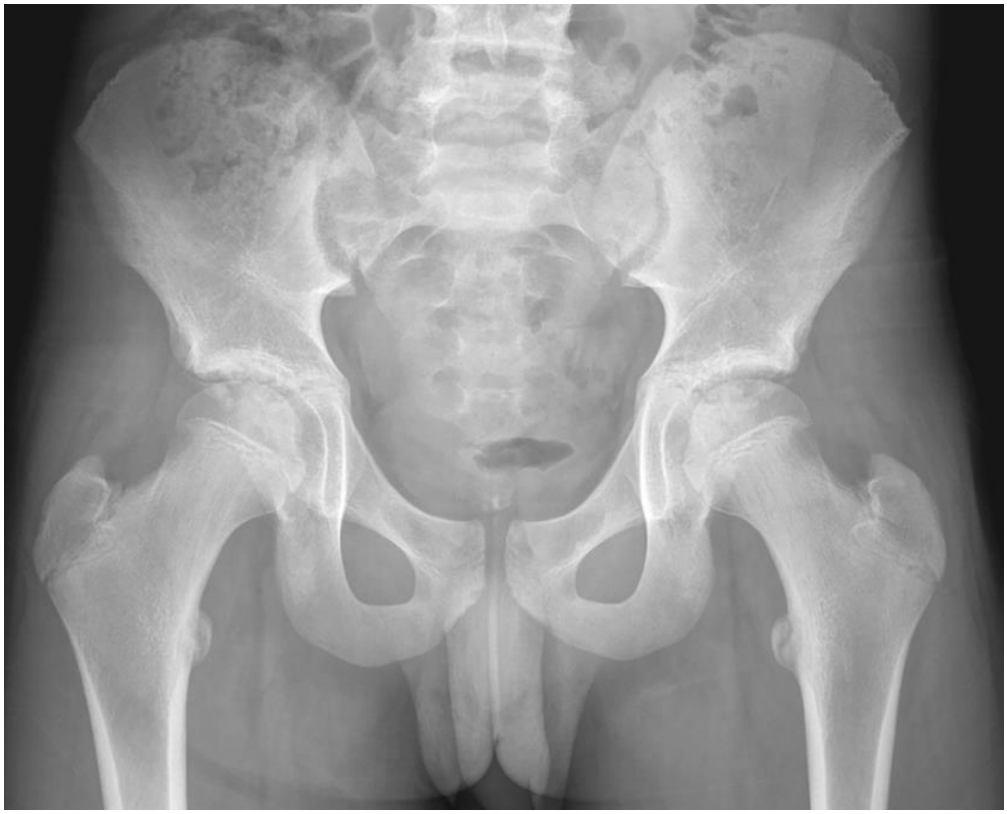

Fig. 1. The radiograph is plan and showing that the AP view of pelvis is normal anatomy without any deformity

Culture of mycobacterium Tuberculosis:

Result: it is negative not detected
Ultrasound abdomen: Normal
Echo: Normal
Fundoscopy: Normal

MRI Pelvis with both hips:

Report: Altered marrow signals and heterogeneously enhancing soft tissues mass are seen involving the left femoral head with pathological fracture of neck and superolateral displacement of proximal femoral shaft. There is a small associated T1 hyper intense collection along the anterolateral aspect of the femoral head. Suggesting hematoma. There is extensive edema and heterogeneous enhancement in the muscle and soft tissues surrounding the left hip joint. There is minimal association left hip joint effusion. Left acetabulum and pelvis bone reveal normal signals. Right hip joint and femur are normal. Few prominent lymph nodes are seen in the left ilioinguinal region. Visualized sections of pelvis reveal mild ascites. Note is made of generalized abdominal wall edema.

Conclusion: Soft tissue mass in the left femoral head and neck with pathological femoral neck fracture and small collection/ hematoma. Histopathological correlation is suggested.

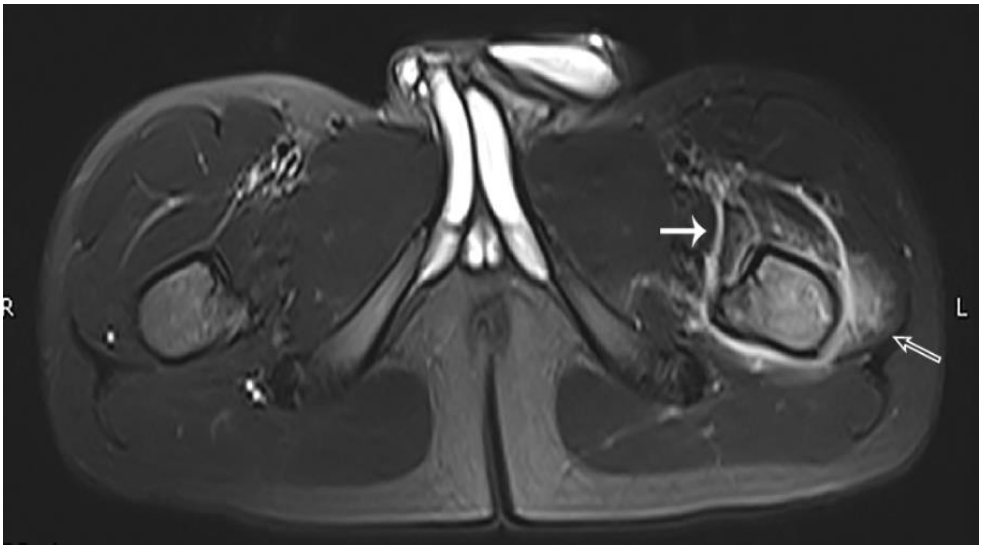

Fig. 2. MRI showing high signal edema around the left femur and surrounding hip musculature suggestive of chronic osteomyelitis

Treatment:

Table 2. Treatment received. Inj.,injection ; Syp., Inf.infusion, ; Tab, tablet; IV, intravenous; PO, per oral; TSF, teaspoon; OD, once daily; TDS, thrice daily; BD, twice daily

Serial No.	Name of a drug	Route of administration	Dosage	Duration
1.	Multibionta	Syp	2tsf	24 Hourly
2.	Tramadol	IV	25 mg	12 Hourly as per need
3.	Vancomycin	IV	500 mg (15 mg/kg)	q12h for 1 week followed by
4.	Ciprofloxacin	Syrup	250 mg	8 Hourly
5.	Sunny D	Syp	1tsf	24 Hourly
Home Treatment: upon sensitivity of bacteria to antibiotics				
1.	Ibuprofen	Syp	1tsf	8 hourly
2.	Panadol	Syp	1tsf	8 hourly
3	Augmentin	syp	1 TSF	8 hourly
4	Co trimazole	syp	1 tsf	8 Hourly

Literature review of chronic pain from osteomyelitis:

Treatment: Includes different types of treatment approaches such as;

Simple analgesic: Acetaminophen NSAIDS are considered in the treatment of chronic nonmalignant pain among kids, however there is some limitation to it .Topical NSAIDS can be used as well for local pain. Lidocaine patch can be considered as a good option among children and adults for localized pain.

Anticonvulsants and antidepressants: anti-epileptic may be a multimodal strategy for managing neuropathic pain. Low dose amitriptyline should be considered for gastrointestinal disorders. Gabapentin anti conversant should be considered the first line of treatment and pregabalin as a second [7].

Nonstandard analgesic: bisphosphonates can be used in kids in chronic pain, baclofen can also be considered in patients with spasticity and cerebral palsy.

Opioids: rarely used in kids just because of their adverse effects.it should be avoided.[1]

Psychosocial and behavioral therapy: psychotherapy is talk therapy, and can help to reduce pain, anxiety, and depression. Its aim is to identify people and change unhealthy emotions, thoughts and behaviors. In this therapy a psychologist talks to a patient to help them cope better with the factors that can lead to the contribution of pain [8].

Patient education: Discuss age appropriate care of the patients to ensure compliance to medications.familial compliance with proper dosing of antibiotics when choosing an appropriate oral regimen [9].

Differential Diagnosis: There are 4 categories of pain, neuropathic, mechanical, musculoskeletal and inflammatory, each according to different protocols. Persistent and undertreated painful conditions can lead to chronic conditions. Acute pain should be treated to prevent prolongation of condition [10].

Table 3. Non pharmacologic Analgesic in pediatrics

Serial	Non pharmacological Analgesic modalities
1.	Ice/Heat
2.	Buzzy e.g. toys
3.	Parents comfort

Table 4. Pharmacological analgesic used in chronic pain

Route	Consideration	Examples
Topical	Mucosal or cutaneous	**Ethyl chloride**
Oral	Mild to moderate pain	Acetaminophen, NSAIDs
Subcutaneous	Severe pain	Opioids
Intravenous	Severe pain	NSAIDs, Opioids
Inhaled	Unable to tolerate per oral	Opioids, Ketamine
Intranasal	Unable to tolerate per oral	Opioids, Ketamine
Per rectum	Unable to tolerate per oral	NSAIDs

Table 5. Differential Diagnosis

Serial	Differential diagnosis	Explanation
1.	Hamstring or quadriceps muscle spasm or strain	Spasm may be related to growth, resulting in tightening.
2.	Spondylolysis	Referring to knee joint
3.	Sciatic pain	Referring to knee joint
4.	Scoliosis	Lateral curvature of a spine of a more than 10%
5.	Lumbar disc herniation	

Table 6. Acute complication of chronic osteomyelitis A-SCORE and chronic complication C-SCORE

A-SCORE Points		C-SCORE Points
bone abscess	2	CRP>100 mg/L at 2-4 days after starting antibiotics
prolong fever > 48 hours after starting antibiotics	2	Disseminated disease
Suppurative arthritis	3	bone debridement
Disseminated disease	4	Maximum Score
delayed source control	4	
Maximum Score 15	15	

Table 7. Cierney-Mader classification of Chronic osteomyelitis given below

Anatomical Type	delete this cell only	Physiological Type	Delete This Cell
Types	**Characteristics**	**Class**	**Characteristics**
Type 1	medullary osteomyelitis	**A**	Good immune system and delivery
Type 2	superficial osteomyelitis	**B**	compromised locally or systemically
Type 3	localized osteomyelitis	**C**	Require suppressive or no treatment;minimal disability; treatment worse than disease;not a surgical treatment.
Type 4	diffuse osteomyelitis		

Table 8. Acute and chronic score in assessing chronic osteomyelitis pain

A-Score		C-Score	
Bone abscess	2	CRP>100 mg/L 2-4 days after antibiotics	1
Fever >48 hours	2	Disseminated Disease	1
Suppurative arthritis	3	Bone debridement	2
Disseminated disease	4	Maximum Score	**4**
Delayed source control	4		
Maximum Score	**15**		

Staging: Adult osteomyelitis staging is present for treatment and diagnosis.Cierny-mader classification is the newest system to aid for host treatment [10]. Its Table 7 is given above.

Etiology: Staphylococcus aureus is the most common cause of osteomyelitis, followed by streptococcus pneumoniae and streptococcus pyogenes, gram negative bacteria and group B streptococci are frequently seen in newborns. Children of most immunocompromised are more susceptible. Salmonella is mostly the agent for osteomyelitis in kids with sickle cell anemia. Anaerobes rarely cause it [11]. Bone can get infected via the hematogenous route of infection through bacteremic seeding of bone from a distant source of infection, contiguous spread from surrounding tissue and joints, or direct inoculation of bone from trauma or surgery.

Morbidity/mortality: Deep venous thrombosis can develop and fracture can occur.

Prognosis: chronic pain can result in 30% decrease in patient pain score. A thirty percent decrease in pain can improve a patient's symptoms, quality of life. Improvement is seen with painkillers and co-morbidity as well. Chronic pain can increase morbidity and mortality. Patients with chronic pain are more prone to suicide as compare to normal population [12]. Tolerance can occur in 20-40% of patients. Spinal cord stimulation can result in temporary pain relief but the effectiveness decreases over time.

3. DISCUSSION

“The prevalence of chronic pain in adults is 20% which is 1 in 5 children worldwide. There is much variability among results of individual studies in girls; the prevalence of chronic pain is much higher than boy’s for all types except for back pain and musculoskeletal pain. Risk of bias is low or moderately low” [13]. “Chronic pain is a common health issue despite its prevention and calls for transformative actions, few studies show that chronic pain during covid pandemic has a decreased prevalence compared with pre pandemic studies. After intraoperative cultures have been obtained, surgical intervention should consist of sharp debridement of all necrotic appearing tissue, sequestrectomy, abscess drainage, removal of any hardware or other foreign bodies, and large-volume irrigation” [14]. If needed, “a cortical window can be created under fluoroscopic guidance to aid in accessing the sequestrum or abscesses; care should be taken to avoid damaging the physis. In the setting of large areas of bony involvement with resultant bony defects after debridement, the Masquelet technique for staged treatment has also been proposed” [15].

“Osteomyelitis is a complicated infection to treat. In most cases, management involves a multifaceted, interprofessional approach, including the primary care provider, radiologist, surgeons (orthopedic, vascular), a podiatrist, an infectious disease specialist, pharmacist, nurse wound care team, and sometimes a plastic surgeon, a pain specialist or interventional radiologist. The primary care provider often plays a vital role in the initial diagnosis and coordination of care across these medical and surgical specialties” [15].

“After surgical debridement and the identification of a known pathogen, IV antibiotic therapy should be initiated. The ideal length of IV antibiotics is debated, however, the commonly accepted practice is to continue parenteral antibiotics until the patient has shown clinical improvement and inflammatory markers have begun to normalize. At that time, the transition to oral antibiotics can occur” [16].

“The optimal length of oral antibiotic therapy is also debated, but common practice includes a total of at least 4-6 weeks of antibiotic therapy. Some studies suggest that a longer duration of therapy may be required if adjacent joint involvement is noted” At the time of scheduled completion of antibiotics, ESR and CRP should be obtained; if these labs remain elevated, an additional 2-3 weeks of oral antibiotics should be given [16]. “If inflammatory markers have not normalized after 12 weeks of antibiotic therapy, repeat MRI should be considered to assess for continued evidence of infection. Other studies have shown that covid 19 has a negative impact on chronic pain. There are more limitations in this field and this limits the ability to understand the impact of different factors on chronic pain. Therefore more work is needed to be done by researchers” [16]. Application of novel nanomaterials in the treatment of osteomyelitis are Silver nanoparticles which are combined with antibacterial agents as organic compounds or antibiotics it has shown synergistic effect against pathogens bacteria such as *Escherichia coli* and *Staphylococcus aureus,* Treat infections or prevent them efficiently [17]. “Gold nano cluster have also been used Exhibit excellent treatment effects in both macrophages and animal infection models induced by MRSA as representative, which does affect the bacteria by Inhibition of MRSA biofilm formation. The induction of intracellular ROS production in bacterial cells” [18]. Ca-Alg nano particle Clindamycin loaded Ca-Alg/PPAA system showed sustained Clindamycin release from the carrier. Exhibited better cell viability of synthesized materials against MG63 cells. Sustained drug release. Promotes bone regeneration [19].

4. CONCLUSIONS

Prevalence of chronic pain varies by age, type, race, gender, age and by much more girls have prevalence as compared to boys overall by headache, musculoskeletal. Chronic pain in pediatrics may be associated to osteomalacia, or osteopenia, it may be infectious, may be due to malignancy or fra cture, but it shall be investigated with MRI na biopsy if the pain persists and not reliving with analgesics and supplements. Ignorance of chronic osteomyelitis can have poor outcomes.

5. LIMITATION

As the evidence identified by the author is of limited quality.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image

generators have been used during writing or editing of this manuscript.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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