The Impact of Misdiagnosis and Delay in Childhood Bone and Joint Infection

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INTRODUCTION:

Prompt diagnosis and treatment for childhood bone and joint infection (BJI) is necessary to avoid long-term consequences of disease.Clinical algorithms for diagnosis developed in the 1990s and early 2000s are inadequate for the current clinical environment and predispose to misdiagnosis and delayed treatment. Delayed treatment and diagnosis of acute childhood bone and joint infection (BJI) is presumed to be associated with higher morbidity and cost.

METHODS:

A retrospective review was undertaken of patients <16 years with acute haematogenous osteomyelitis (AHO) or septic arthritis (SA) treated in the Auckland region from 2018-2023. Electronic case information was used to identify any alternative diagnosis given prior to identification of BJI. Cases were grouped as multifocal sepsis and shock, “isolated” AHO or SA, and those with disseminated local infection such as pyomyositis and subperiosteal abscess. Duration of symptoms and details of presenting complaint were collected. Length of stay, number of surgeries, and duration of combined intravenous and oral antibiotic therapy were recorded. The cost of hospitalisations was determined using a weighted discharge value (i.e., Weighted Inlier Equivalent Separations [WIES]) for all National Minimum Dataset events as calculated by the New Zealand Ministry of Health.

RESULTS:

A total 563 cases of childhood BJI were treated over this period of which 512 had clear documentation of presenting complaint.

Almost half of children received an initial misdiagnosis before identification of BJI (43%). A “classical” presentation with fever and pain at the site of infection was only seen in 45%. History of a recent viral illness was common (39%), along with history of trauma (23%).

Children who were ‘misdiagnosed’ were more likely to have presented to a community medical centre (82% vs. 38%, p=<0.0001). They were equally likely to present with fever and pain at infection site (47% vs. 44%, p=0.62). However, they were more likely to have a recent viral illness (46% vs. 34%, p=0.008).

Delay between symptom onset and admission for BJI was greater after initial misdiagnosis (7.8 vs. 4 days, p=<0.0001). Once hospitalised, children with initial misdiagnosis were equally likely to require surgery (50% vs. 53%, p=0.56).

Children with > 1 week of symptoms had higher rates of disseminated local infection (34%, vs. 17%, p=0.002).

Surgical intervention for disseminated disease was more likely than for isolated AHO (70% vs. 14%, p=0.0001). Children with locally disseminated infection spent longer in hospital (8.42 vs. 5.14 days, p=<0.0001). Hospitalisation cost appeared higher but did not reach statistical significance ($14,102 vs $8587, p=0.26).

DISCUSSION AND CONCLUSION:

In this study almost half of children with BJI were initially misdiagnosed. Misdiagnosed children were more likely to have attended community medical centres and report a recent viral illness. Initial misdiagnosis delayed treatment by an average of 3.8 days.

Greater duration of symptoms is associated with locally disseminated forms of BJI. The consequences of this can be seen clinically as increased need for surgical intervention and greater morbidity. Hospitalisation for locally disseminated infections was on average three days longer, with direct hospitalisation costs almost twice as high as those for “isolated” infection.

A high rate of misdiagnosis suggests poorly understood disease aetiology. Traditional teaching emphasises the relationship between viral illnesses and transient synovitis, without acknowledging a potential relationship between viral infections and bacterial BJI.

There are several aspects of this work which could be used to inform ongoing clinical practice. Firstly, models of teaching and diagnosis for BJI should reflect current clinical and molecular epidemiology of disease. This means, ongoing collection of data around presentation and causative pathogens is essential to inform surgeons and the wider medical community.

Secondly, without accessible imaging and laboratory testing it is very difficult to diagnose childhood BJI. This is reflected in the greater delay to treatment and diagnosis after presentation to community medical centres. This could be mitigated by early specialist referral.

Overall, our study has found that childhood AHO and SA are frequently misdiagnosed, leading to delayed treatment initiation. Delays of > 1 week were associated with disseminated infection, which often requires surgery with prolonged morbidity and cost.