Optimal timing for advanced imaging in Childhood Bone and Joint Infection

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Advanced imaging in the management of childhood bone and joint infection (BJI) has the potential to improve disease outcomes. Knowledge about the optimal timing for MRI in relation to both surgically and non-surgically managed BJI is limited. This study examines the impact of MRI timing on number of surgeries, length of stay (LOS), hospitalisation cost, and disease recurrence in childhood BJI.

METHODS: <u>This is a</u>A retrospective review of patients <16 years with acute haematogenous osteomyelitis (AHO) or septic arthritis (SA) treated in the Auckland region from 2018-2023. Cases were included if they underwent MRI as part of diagnostic workup. Data collected described treatment, hours between admission and MRI, LOS, hospitalisation cost, and infection recurrence. Children who presented with sepsis and/or required admission to the PICU were considered 'severe' cases.

RESULTS:

There were 563 cases of BJI, of which 390 met inclusion criteria. Cases were primarily AHO (85%). Utilisation of MRI increased over the study period. MRI was performed in 54% of BJI cases in early 2018 with this percentage rising steadily to 80% of cases receiving an MRI in 2023.

Locally disseminated infection such as pyomyositis or adjacent septic arthritis occurred in almost half of children (48%). Children who received a pre-operative MRI (n=145) had a significantly lower re-operation rate than those who received an MRI post-operatively (33% vs. 77%, p=<0.05). Children who had a pre-operative MRI also had shorter average length of stay (LOS) (14.1 days vs. 22.4 days, p=0.002). The average hospitalisation cost appeared lower but this did not reach statistical significance (\$59,419 vs 159,353, p=0.12).

Subgroup analysis was performed looking specifically at MRI use in cases of severe illness. In severely unwell children, the reoperation rate was also significantly lowered by preoperative MRI (88% vs 47%, p=<0.05).

In cases managed without surgery, LOS was reduced if MRI occurred within 48 hours of admission (7.3 vs. 10 days, p=0.03). Disease recurrence was not associated with MRI timing.

DISCUSSION AND CONCLUSION:

For all surgically managed childhood BJI, obtaining a pre-operative MRI scan lowered reoperation rates and reduced hospital LOS. Although not reaching statistical significance, the average hospitalisation cost for a child receiving pre-operative MRI was almost \$100,000 lower (\$59,419 vs \$159,353).

Preoperative MRI also reduced reoperation rates in children identified as severely unwell. This challenges previous assumptions about immediate progression to theatre in cases of sepsis. Potential benefit from urgent surgical debridement appears to be offset by the risk of performing a less effective surgery without advanced imaging.

This is the largest study to date specifically considering the question of MRI timing in management of childhood osteomyelitis and septic arthritis. Previously reported studies showing the utility of early MRI scanning included fewer cases, as this would be considered a relatively rare diagnosis. Unfortunately, in New Zealand, rates of childhood BJI are among the highest in the developed world. This disease burden can only be reduced with effective collection and analysis of data, identifying strategies that can be implemented here and now.

The findings from this study support protocols for MRI scanning in all cases of childhood BJI. These have the potential to streamline treatment and lower direct medical costs.

