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EDITORIAL COMMENTARY

Peripheral Muscle Ultrasonography in Critically Ill Children - An Evolving Tool

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Intensive care unit - acquired weakness (ICUAW) is a well-described entity in critically ill patients. It is known to influence the functional recovery of patients and the duration of ICU stay. Recent studies indicate that the prevalence of ICUAW can be as high as 30–70% [1]. Early diagnosis of muscle atrophy may help identify candidates for early interventions to enhance mobility with better functional outcomes. The current gold standard for muscle evaluation, including electrophysiology testing, computed tomography (CT)/ magnetic resonance imaging (MRI)/ and muscle biopsies, are either cost-prohibitive, invasive or unavailable widely.

The universal availability of ultrasonography in most ICUs provides a unique opportunity to evaluate ICUAW and generate scientific evidence regarding clinically relevant outcomes. The study by Jain et al. in this issue of the journal is a meticulously designed, well-conducted research assessing the use of muscle thickness (MT) and echogenicity of quadriceps femoris (QF) to diagnose muscle atrophy in a cohort of 58 mechanically ventilated children [2]. The authors documented a low baseline MT in their cohort with no decline in MT on serial measurements over 7 d. Half of the study cohort had chronic illnesses, possibly accounting for lower baseline MT. Contrary to the expectation, a paradoxical increase in MT was observed in the first 72 h of mechanical ventilation (MV). Thus, it is hypothesised that fluid shifts occurring in the acute phase of illness could have masked the underlying muscle atrophy causing falsely higher MT values.

They also reported on muscle echogenicity, a much more complex variable which is highly operator and software dependent. The authors reported a differential pattern in serial echogenicity change in two muscles where rectus femoris showed higher echogenicity with time while no difference was observed in vastus intermedius. They also reported a significantly higher echogenicity in the non-survivors. Various factors, including time-gain compensation, the angle of incidence of the transducer, power, and excess subcutaneous edema, can distort echogenicity measurements. Nonetheless, it can serve as a marker for muscle disease, but its correlation with duration of ventilation and mortality needs further exploration. Very few studies have evaluated this parameter in children [3]. This study can act as a stimulus for further research on the utility of this variable.

Some studies have shown that muscle cross-sectional area measurements provide more accurate results than two-dimensional measurements of MT alone [4]. However, since muscle dimensions vary with location, proper site selection is a prerequisite for obtaining reliable normative data and performing serial measurements over time. This study used the midpoint between anterior superior iliac spine and superior border of patella, whereas some studies have chosen two-thirds of the length between the anterior superior iliac spine and the upper border of the patella [3, 5]. These factors act as a source of heterogeneity in the results, thus limiting the applicability of the findings.

In conclusion, ultrasonography is emerging as a valuable and practical tool for assessing muscle mass in the ICU and thus may help monitor ICUAW. However, further research is needed to determine the prognostic role of peripheral muscle ultrasonography in critically ill children. Also, comparison with a gold standard like EMG or MRI may help place the relevance of these findings.

Declarations

Conflict of Interest None.

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