Biceps Area Ratio (BAR) Can Predict The Need for Surgery in Brachial Plexus Birth Palsy: A Pilot Study

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The Problem
It can be difficult to decide who should get nerve reconstruction surgery
Decision algorithms based on physical exam
Physical examination of an infant is:
   Difficult
   Time Consuming
   Subjective
   Requires a lot of experience
Unhelpful Solutions:
   MRI/CT
   NCS/EMG
What would a solution look like?

Objective

Repeatable

Fast

Cheap

Easy to learn

Assumptions

Denervated muscle is smaller than innervated muscle
Muscle atrophy can be seen in neurologic conditions (e.g. thenar wasting in carpal tunnel syndrome)

As muscle gets stronger, it gets larger

Therefore, if we can measure that the biceps is smaller than usual, we have objectively shown it is denervated

If we can measure improvements in biceps size, we can objectively show increase in muscle strength
Biceps Area Ratio

Using in-office ultrasound machine, the cross-sectional area of the biceps is measured at the midpoint between the acromion and the elbow flexion crease. Both the affected and unaffected arms are measured. The unaffected arm serves as a control, so that the measurement is:

\[
Biceps \ Area \ Ratio = \frac{Area \ of \ Biceps \ on \ Side \ with \ BPBP}{Area \ of \ Biceps \ on \ Side \ without \ BPBP}
\]
BAR Differences Can Be Predictive of Surgery

BAR Differences Can Offer Reassurance
BAR Correlation with Active Movement Scale

Biceps Echogenicity

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Future Directions

Refine technique
- Where on the arm to place probe
- Elbow flexed or extended
- How much pressure to apply with probe to the biceps?

Consider other types of measurements
- Different muscles? Have tried SS
- Echogenicity

More patients

End goal
- Define criteria based on ultrasound examination to:
  - Indicate patients for surgery
  - Guide surgical decision making. Can we tell the difference between good partial recovery and those that should be excised and grafted?

Thank you!
If anyone wants to make this a multicenter, please talk to me
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