Editorial on "*No correlation between serum markers and early functional outcome after contemporary THA*"

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What do we know now?

To date, our field has been dependent upon established outcome metrics to evaluate the variety of approaches to total hip arthroplasty (THA) (SF-36, WOMAC, HSS). Newer measures have been used to supplement these scores including, gait analysis, serum makers and magnetic resonance imaging (MRI). However, the clinical applicability of these tools remains unclear.

In a recent study, Poehling-Monaghan *et al.* attempt to correlate serum inflammatory and muscle injury markers to outcome measures after THA comparing anterior to posterior approaches. This study is a logical extension of our previous study. We reported an increase in postoperative serum CK in patients who underwent a posterior approach compared to those who underwent a direct anterior approach (1). In their study, Poehling-Monaghan *et al.* found that while some markers rose after surgery (CPK, myoglobin, CRP, IL-6), changes in these markers did not consistently correlate with patient outcome scores. In fact, they reported minimal differences in outcome measures between the two groups; pain scores and distance walked in the hospital favored the anterior approach. However, this study had limitations. Previous studies have shown a potential improvement in early functional scores, and mobility with the anterior approach, specifically within the first 6–8 weeks before normalizing thereafter (2-4). The authors did not record outcome measures in this window. Poehling-Monaghan *et al.* asked the patient for a diary and performed their first follow up at 8 weeks measuring the HHS. They saw a loss to follow up ranging from 10–43% in their diary responses, which can also be susceptible to recall bias. A shrewder design would have included office follow up with more established assessment scores (e.g., HHS, WOMAC) at consistent time points similar to previous studies (5). Nevertheless, what we have learned is that while there are potentially early improvements in pain scores and mobility, and the anterior approach does increase serum CK levels, it is difficult to conclude that these biomarkers correlate with functional changes.

What are the next steps?

This study is commendable, but a number of questions remain. What approach is best in THA: anterior, posterior, anterolateral, direct lateral? How is this measured? Are outcomes using the standard subjective measures sufficient to assess superiority (WOMAC, HSS, SF-36)? Do objective measures like biochemical markers (IL-8, IL-10, superoxide dismutase and total antioxidative capacity) have a role? Do other objective measures have a role: gait analysis, imaging studies, and/or anatomical evaluations? If we look for more objective markers these must be correlated with clinical outcomes. Currently there are few standards, and until we establish reliable tools to measure outcomes, many of these questions will remain.

Outcomes are important to many stakeholders. Patients, hospitals, insurance companies, even the government want to see outcomes improving as a measure of medical quality. With a procedure such as THA, this is hard to achieve since the outcomes are already excellent (6,7).

Lastly, safety is a concern when transitioning to the anterior approach. Our study, as well as this study by Poehling-Monaghan *et al.*, did not address this issue. What we know is that the anterior approach appears safe in experienced hands, but there is a quantifiable learning curve (8,9). We need data that measures safety objectively.

How do we get there?

The assumption that there is less muscle damage and inflammation during a less invasive approaches may be flawed. Even if that is the case, certainly a less invasive approach may not correlate with patient satisfaction and outcomes. While several markers of inflammation and muscle injury (CPK, IL-6, TNF) have been investigated, other serum makers may be more valuable. Perhaps collaboration with basic science faculty will improve our understanding of the biochemical processes that affect clinical outcomes.

Precise and proper study design and methodology is paramount to discover the smallest of differences. Barrett el al. using randomization and a prospective study design were the closest to ideal design (2). While blinding is important, the methodology of performing a blinded study on hip approaches may be particularly challenging.

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