Docket #: S19-526

Torque Sensing Retractors that Reduce Tendon and Muscle Damage

Derek F. Amanatullah and his research group developed an instrumented retractor that was designed to record the applied force, duration, and angle of retraction during a piriformis-sparing posterior approach to the hip. Piriformis-sparing posterior approaches to the hip allow surgeons to avoid releasing the piriformis tendon during total hip arthroplasty. However, the consequence of retracting an intact piriformis musculotendinous complex during a piriformis-sparing posterior approach to the hip remains ill-defined. Dr. Amanatullah used the retractor to determine the upper limit of force that can be applied during retraction of the piriformis musculotendinous complex and quantifies the subsequent damage to the piriformis musculotendinous complex caused by retraction. In addition to the data collected with use of the instrumented retractor, damage to the piriformis muscle and tendon was quantified by a blinded observer. There was no damage to the piriformis tendon in 22 (96%) of 23 hips during piriformis retraction for visualization of the hip capsule. However, there was complete or partial damage to the piriformis muscle at the sacral origin, belly, or musculotendinous junction (i.e., outside the surgical field) noted in 21 (91%) of 23 hips. The mean peak force to failure of the piriformis muscle was exceedingly small (29.0 ± 9.4 N; range, 10.1 to 44.9 N). The mean peak force applied to the piriformis retractor is much less than the force required for several common daily activities, such as opening a door or crushing an empty aluminum can. Dr. Amanatullah et al. (2020) in the *Journal of Bone and Joint Surgery* concluded that soft tissue damage that occurs outside the surgical field during the retraction of unreleased muscles, like the piriformis muscle, is common and remains an uncontrolled surgical variable. This inadvertent soft tissue damage is not routinely accounted for when accessing the invasiveness of a procedure. Hence, it is no longer adequate to define a minimally invasive surgical procedure simply as an approach that involves the limited release of anatomical structures. The use of instrumented retractors redefines surgical invasiveness by providing data that could alter our understanding of the soft tissue damage caused by retraction and open the

possibility of robot-assisted or damage limiting retractor systems.

Stage of Research

- Prototype

Applications

- **Surgical procedures**
- Joint replacements

Advantages

- **Real time monitoring**
- Force and angle measurements for soft tissue damage warnings

Publications

- D.F. Amanatullah, H.N. Shah, A.A. Barrett and H.W. Storaci A Small Amount of Retraction Force Results in Inadvertent Piriformis Muscle Damage During a Piriformis-Sparing Approach to the Hip *Journal of Bone and Joint Surgery* 2020.

Innovators

- Derek Amanatullah
- Hunter Storaci
- Andrew Barrett
- Harsh Shah

Licensing Contact

Seth Rodgers

Licensing Manager, Life Sciences

Email