Editorial Commentary: Moving the Needle: Traditional Inside-Out Meniscal Repair Has Advantages Over All-Inside Repair

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Abstract: Meniscus repairs for vertical, peripheral tears can be troublesome due to poor tissue quality and/or vascularity that can lead to re-rupture and subsequent removal. The gold standard, inside-out repair technique, has been challenged by all-inside devices for the benefit of improved efficiency and less morbidity but for the sake of expense and potential structural inferiority. Successful meniscus repair requires multiple components, only one of which is deciding the repair construct of choice. I feel the most important aspect will always be the indication based on tear configuration while respecting biology, because all fixation will eventually fail if the meniscus does not ultimately heal. While all-inside devices may have biomechanical properties that are similar to inside-out techniques, the burden of proof still lies on showing superiority of these devices in a clinical setting. Clinically, I still use inside-out repair techniques for large tears or for high-demand patients due to its structural integrity and small penetration of the meniscus.

See related article on page 3001

Meniscal repair still remains an elusive entity when it comes to understanding which tears are indicated and will subsequently result in decreased chance of re-tear and restore native meniscus function. From private insurer databases alone, more than 85,000 meniscus procedures were performed within a 5-year window.[1] Clearly, meniscal injuries represent a significant volume in orthopaedic surgery, and our management decisions continue to be shaped by various biomechanical and clinical analyses. Many of us start practice trying to repair as many menisci as possible because we feel we need to give them a chance to heal, but in reality, more than 20% may go on to meniscectomy.[2] Our increased desire for repair may arise from the realization that we "can" and not necessarily that we "should." With expanding indications to address posterior radial tears, horizontal cleavage tears, and root tears, implicated in osteoarthritis progression, the applicability of all-inside devices becomes even more relevant to put to the test.[3] Current training programs are replete in use of all-inside meniscal repair devices, whereas the inside-out repair technique has fallen by the wayside due to increased operative time and concern for technical difficulty. However, in the setting of value-driven care, a team familiar with inside-out technique may deliver better value to the patient than opting for multiple all-inside devices. Regardless, all-inside repair devices are here to stay and certainly play a role in the treatment of meniscus tears, but the increasing number of options can make it difficult to know what options are commodities or truly move the needle.

The study by Barber, Howard, Ashraf, and Spenciner[4] entitled "The Biomechanical Performance of the Latest All-Inside Meniscal Repair Devices" is a well-designed biomechanics study that evaluates the strength of contemporary all-inside repair devices compared with the traditional inside-out repair technique. The factors that lead a surgeon to use a certain all-inside repair device can be many, but few if any are evidence based. Studies that work to demonstrate objective superiority are crucial as clinicians navigate this space. The article

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by Barber et al. certainly works toward adding a piece to this puzzle by giving us some objective data on meniscal repair device stiffness and ultimate load to failure data. I feel it is important to interpret this information exactly as stated—a piece of the puzzle—not the entire picture. An important take-home from the study is that many repair devices failed in this model by the implant pulling through the capsule and not the meniscus through the suture. These findings were similar with all suture devices, which also conveyed the weakest biomechanical properties. When considering this finding in the context of other orthopaedic literature, this is contrary to current rotator cuff repair literature that demonstrates that our failure is clearly at the tendon–bone interface, not the implant–bone interface. While these findings seem concerning, clinically I use a PEEK (polyether ether ketone)-based all-inside repair device, and the failures I have seen are typically related the tissue pulling through the suture and not the implant from the capsule, which further emphasizes our need to look at this in the lens of clinical relevancy.

The work by Barber et al. is well designed and gives us time-zero information on different repair constructs, but there are some drawbacks that also need to be considered. As this is a cadaveric model with normal menisci, it is unclear if any of these devices may have different properties in damaged meniscal tissue. More importantly, even if the differences seen in this study are identical ex vivo, the clinical translation of this information is unknown as statistical differences were noticed in failure and elongation but these may not be clinically meaningful differences. We have enough knowledge in the fracture healing world to know that more comminuted fractures heal better with relative stability and simple patterns with absolute stability. However, in the meniscus repair world, are we always better served by a more stiff and stronger repair device? How strong is "strong enough"?

Current clinical evidence would suggest that all-inside repair devices may have similar outcomes to inside-out repairs, although these studies do not control for meniscus tear size.[5] Studies specific to tear type might further elucidate any potential differences in the repair construct. In a study looking specifically at bucket handle meniscus repair, the repair construct did not affect outcomes; however, this study did demonstrate that the meniscus tear occurring in isolation increased failure rates.[6] This, along with other studies, shows that the biology at the time of meniscus repair is arguably more crucial than the structural aspect alone, with some mixed benefit of platelet-rich plasma and marrow venting.[7]

How does this study affect my clinical care? Ultimately, this is one data point that needs to be considered in conjunction with many other factors that are beyond the scope of this study: What is your comfort level with the device? How often does it misfire, adding to surgical time and need for device removal? How much does it cost? How large is the hole created during penetration of the meniscus tissue? To date, I believe in the benefit of all-inside devices and choose the type of device that is most consistent in my hands when tears can benefit from 1-3 devices. In the setting of larger tears (bucket handle or meniscus transplants) or in higher-demand patients, I default to inside-out repairs until there is more compelling evidence across the board. There have been many sea changes in orthopaedics, such as the transition from open to arthroscopic rotator cuff repair and shoulder stabilization, and meniscus repair may be following suit. These changes challenge our status quo and through evaluating new techniques, we are forced to re-evaluate our gold-standards and determine if they really deserve that moniker.

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