Superior capsular reconstruction (SCR) has quickly become a widely used technique for shoulder surgeons seeking to improve outcomes for patients suffering from massive irreparable rotator cuff tears. Initially described by Teruhisa Mihata in 2012 as a technique to restore function and improve pain in the context of lack of availability of reverse total shoulder replacement in Japan, it has become a mainstay treatment for some that have adopted its use in their routine practice.

The “S curve” of technology and product design has been described as a model for understanding how an industry/technology/product develops over time and effort. Each “S curve” can be divided into a lower portion, a middle portion, and a top portion, resulting in a maturation point. The lower portion reflects early innovation, often resulting in high levels of competition to determine the dominant design. The middle portion reflects growth and is driven by the ability to overcome major technical obstacles and satisfy demand. This phase also represents full market acceptance. The top portion of the “S curve” represents the natural limit of the technology/product within the market, whereby maturation occurs, and innovation becomes incremental. At the maturation point, there is an opportunity for discontinuity, where a new technology that disrupts the industry starts a new “S curve.”

The SCR may indeed follow the technology “S curve.” The lower portion represents the original innovation of the technique by Mihata. The middle, growth, portion represents its increased use, initially in Japan and Korea. As the first “S curve” reaches maturation, it is disrupted by a new “S curve,” brought about by the application of dermal allografts. This new “S curve” has a middle portion of vast growth characterized by innovation of techniques aimed at simplifying the execution and reducing the risks (donor-site morbidity/failure of fixation). As this second “S curve” reaches maturation, publications questioning the indications and efficacy of the SCR become more prevalent (Fig 1).

For some, the tale of the SCR is one of creative innovation that has revolutionized the management of a complex problem. However, it can be seen as a cautionary tale of how industry forces, clinical champions, and surgical enthusiasm can prevail despite a lack of robust scientific evaluation. Mihata’s original technique involved using a large harvested fascia lata autograft, doubled/tripled over, and attached to the glenoid and humeral head. The first report in the English literature was in 2013, reporting on 24 cases performed between 2007 and 2009. Soon after, modifications of the technique by renowned shoulder surgeons introduced the use of dermal allograft as a substitute for fascia lata autograft. Later, techniques using long head of biceps autograft have been described. Simplifications aimed at addressing the significant technical challenge of the original technique have been proposed.

The majority of the scientific literature on SCR comprises technical articles on biomechanical principles, various modifications, observational studies, or review articles of observational studies. To date, no randomized controlled trials comparing SCR with simple debridement, biceps tenotomy, and partial repair have been reported. Many remain sceptical of the efficacy of the technique. The hesitancy of adoption may be based on rationale, lack of persuasive narrative as to the biomechanical properties of the superior capsule, or technical difficulties/challenges in execution. The current options available to surgeons treating patients with massive irreparable cuff tears are plentiful, with no clear consensus on which strategy is superior. This is likely due to lack of clinical equipoise and, as such, lack of Level I studies.

Yuval Noah Harari taught us that “Humans have always been better at inventing tools than using them wisely.” We may liken the SCR to another tool, now defunct and thrown into the trashcan of surgical techniques of old, the thermal capsulorrhaphy for shoulder instability. Like the SCR, this technique gained popularity as a solution for a complex problem, multidirectional instability. Similar to SCR, the narrative was clear and easy to comprehend: the capsule is lax, and therefore, “shrinking” it, would help. Unlike the SCR, however, thermal capsulorrhaphy was technically easy to execute. Unlike the SCR, aside from the cost of the radiofrequency ablation device, very few consumables were required. Similar to SCR, however,
its use was followed by countless observational studies demonstrating its “success.”\textsuperscript{19,20} Nearly 10 years after the first scientific article on this technique, it was abandoned.

While it did not take a Level I study to demonstrate this technique was not effective,\textsuperscript{21} surgeons and patients alike are still dealing with the aftermath of this harmful technique. Where SCR and thermal capsulorrhaphy may indeed differ is that SCR may not be harmful in most cases. However, its clinical effectiveness and treatment effect over and beyond partial repair,\textsuperscript{22} tubroplasty,\textsuperscript{23} and biceps tenotomy\textsuperscript{24} has yet to be demonstrated. Another example is the InSpace balloon, an alternative strategy for massive irreparable rotator cuff tears. Ten years after the first report,\textsuperscript{25} a recent high-level study\textsuperscript{26} demonstrated that the implantation of an expensive InSpace balloon did not add any clinical benefit over a simple and inexpensive debridement.

Our goal is not to dissuade surgeons from performing SCR for their patients but rather as a call to the community that we can do better. It is essential to let reason prevail. Before the widespread adoption of a technique influenced by market forces, there should be at least one high-quality randomized controlled trial demonstrating its clinical and cost-effectiveness.\textsuperscript{27} Without this, we are beholden to make the mistakes of old, perpetually innovating new treatments without proper scientific evaluation. The true cost of which will never be fully appreciated.

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References


