Title

Editorial Commentary: PRP: Platelet-Rich Plasma or Promising but Rarely Proven?

Journal

Arthroscopy The Journal of Arthroscopic and Related Surgery, 32(7)

ISSN

0749-8063

Author

Lee, Cassandra A

Publication Date

2016-07-01

DOI

10.1016/j.arthro.2016.05.022

Editorial Commentary: PRP: Platelet-Rich Plasma or Promising but Rarely Proven?

Abstract: Cost-utility analysis using a Markov decision model finds that platelet-rich plasma (PRP) is not cost-effective in rotator cuff repair because of no added outcomes benefit or improvement in retear rate according to best current evidence (Level I to III studies). To achieve the willingness-to-pay threshold, PRP would need to reduce rotator cuff retear rates. The authors have opened dialogue for us to determine what is the value and what should be the cost for PRP when it comes to rotator cuff repair.

See related article on page 1237

Rotator cuff pathology and tearing are synonymous with shoulder pain, representing the most common indication for shoulder surgery. Prior studies have shown that repair is a cost-effective intervention as opposed to conservative management.[1] Despite our best efforts to improve biomechanical fixation, retear rates are significant, especially for large tears.[2,3] However, what potentially muddles our view of the management of rotator cuff tears is the fact that the structural integrity of the repair does not necessarily correlate with patient-reported outcomes.[4] Despite retears, patients have improvements in pain and function that are sustained even in the long term.[5] Furthermore, clinical presentations vary widely from patients with good function and no pain, to those with good function and pain, and finally to those with poor function and no pain, clearly representing heterogeneous pathologies.

Despite the multitude of clinical studies showing no difference in outcome measures after healed repairs versus retears, based on preclinical data, our goal as surgeons is still to achieve healing by improving tendon-to-bone integration. Although the role of biologics as an adjunct in treating tears is unclear, it remains an intriguing potential nonetheless. The most important question is: how can we convert preclinical discoveries to benefit our patients? And, can we do this cost-effectively?

0749-8063/16429/$36.00
http://dx.doi.org/10.1016/j.arthro.2016.05.022

Platelet-rich plasma (PRP) use for the treatment of musculoskeletal maladies has skyrocketed over the past decade, ranging in treatment of acute or chronic sports-related injuries of tendons and muscle to the management of osteoarthritis pain. There is no question about the appeal of PRP comprising growth factors and cytokines within platelets that can induce cellular proliferation, migration, differentiation, and matrix synthesis.[6] Yet, despite all of its potential, the actual mechanism and role of PRP in tissue healing has remained elusive. It has never been prospectively definitively shown to benefit patients.

The role of PRP in arthroscopic rotator cuff repair is the subject of the article by Samuelson et al.,[7] but in the context of cost-effectiveness using a Markov model of analysis. When compared with conventional models, Markov models have more complex assumptions that forecast clinical problems by predicting decisions that involve continuous risk over time where the timing of events and potential repetition of events are important.[8] As with any model or analysis, the resultant quality of the review or assumptions are only as good as the quality of studies within the analysis.

As the Affordable Care Act amplifies focus on delivery of cost-effective health care in an attempt to regulate costs, emphasis is placed on pay-for-performance that aims to improve the quality, efficiency, and overall value of health care, prioritizing value. As physicians, it is incumbent on us to ensure that cost control does not come at the expense of delivering quality health care to our patients. The goals of the Affordable Care Act are to not only provide universal coverage but also expand the use of pay-for-performance approaches, by

encouraging programs that are most effective qualitatively while also reducing costs.

Samuelson et al.[7] aim to answer the question of cost-effectiveness of PRP in rotator cuff repair using a Markov model for analysis. Under the model's root assumption of absolutely no difference in the 31% retear rates between PRP-augmented and non—PRP-augmented groups, PRP's additional cost (venipuncture, kit, not including added OR time) could never be cost-effective. This assumption came from a systematic review by Chahal et al.[9] that analyzed 5 studies with Level I, II, and III evidence. Since that review, there have been 11 more Level I and II studies investigating PRP-augmented rotator cuff repairs. Although there may be some evidence that PRP promotes healing of small- to medium-size tears to reduce retear rates, overall, those are not the tears of concern when compared with the large >3-cm tears that are more likely biologically compromised.

What is unique about this study is the sensitivity analysis that quantifies the incremental benefit in retear rates that are necessary to justify the additional PRP costs in a private outpatient clinical setting. Specifically, at a $750 PRP cost, retear rates would need to decrease by 9.1% to be cost-effective. Interestingly, in a recent meta-analysis and similar cost-effective study by Vavken et al.,[10] PRP was also not found to be cost-effective in both small and large tears. In an academic setting, a PRP cost of $834 (venipuncture, kit, including OR time) would require a reduction of 1 retear in 14 patients (7.1%) to be cost-effective. Intriguingly, they determined a cutoff limit for cost-effectiveness, where the total cost of PRP could not be more than $652.11 (kit cost no more than $268.11).

This study is a very good start to guide our use of existing and new technologies to maximize benefit for our patients in our new cost-conscious world. On the scientific side, we need to continue preclinical investigations and also characterize PRP: what is its mechanism of action? How can it be effective in humans? Is there a dose effect? When should we apply treatment in terms of time of day and timing in conjunction with other procedures? Does age play a role? Standardizing the formulations and fully understanding the interplay of the components of PRP within a biologic system will hold the key to effectively using this biologic tool, which as of now still remains theoretical. On the societal side, we need to at least start thinking about at which point cost-effectiveness of technologies makes sense for us as physicians, patients, and the herd as a whole.

Cassandra A. Lee, M.D.
University of California at Davis

References

1. Mather RC, Koenig L, Acevedo D, et al. The society and economic value of rotator cuff repair. *J Bone Joint Surg Am* 2013;95:1993-2000.
2. Miller BS, Downie BK, Kohen RB, et al. When do rotator cuff repairs fail? Serial ultrasound examination after arthroscopic repair of large and massive rotator cuff tears. *Am J Sport Med* 2011;39:2064-2070.
3. Galatz LM, Ball CM, Teefey SA, et al. The outcome and repair integrity of completely arthroscopically repaired large and massive rotator cuff tears. *J Bone Joint Surg Am* 2004;86:219-224.
4. Russell RD, Knight JR, Mulligan E, Khazzam MS. Structural integrity after rotator cuff repair does not correlate with patient function and pain: A meta-analysis. *J Bone Joint Surg Am* 2014;96:265-271.
5. Paxton ES, Teefey SA, Dahiya N, Keener JD, Yamaguchi K, Galatz LM. Clinical and radiographic outcomes of failed repairs of large or massive rotator cuff tears: Minimum ten-year follow-up. *J Bone Joint Surg Am* 2013;95:627-632.
6. Anitua E, Sanchez M, Zalduendo MM, et al. Fibroblastic response to treatment with different preparations rich in growth factors. *Cell Prolif* 2009;42:162-170.
7. Samuelson EM, Odum SM, Fleischli JE. The cost-effectiveness of using platelet-rich plasma during rotator cuff repair: A Markov model analysis. *Arthroscopy* 2016;32:1237-1244.
8. Sonnenberg FA, Beck JR. Markov models in medical decision making: A practical guide. *Med Decis Making* 1993;13:322-338.
9. Chahal J, Van Thiel GS, Mall N, et al. The role of platelet-rich plasma in arthroscopic rotator cuff repair: A systematic review with quantitative synthesis. *Arthroscopy* 2012;28:1718-1727.
10. Vavken P, Sadoghi P, Palmer M, et al. Platelet-rich plasma reduces retear rates after arthroscopic repair of small- and medium-sized rotator cuff tears but is not cost-effective. *Am J Sports Med* 2015;43:3071-3076.