The term "regenerative medicine" has been used increasingly in medical practice during the past decade [1]. It has been applied in broad areas of medicine from plastic surgery to cardiac disease and neurologic conditions. The term evokes the thought of a futuristic fountain of youth whereby the many conditions of aging, disease, and trauma are reversed to a healthy state by the use of cells capable of differentiating into healthy tissue. Various cells sources to achieve this state have been suggested, including embryonic, autologous, and pluripotent-induced stem cells [2]. This treatment has triggered considerable medical, political, and ethical debate among various concerned groups, particularly regarding the use of embryonic stem cells. The potential benefit of most of these treatments have yet to be realized in the daily practice of medicine, although there has been a rapid increase of various groups promising remarkable benefits from these treatments with a paucity of good scientific evidence. At present, these regenerative techniques remain "experimental" when viewed by Medicare and the various commercial health insurance carriers.

With all the hype associated with the term "regenerative," it is interesting to note that we all "regenerate" on a daily basis, as our bodies create new cells that replenish our blood cells, line our gastrointestinal tract, and reform our skin, and maintain our skeletal system. No one is surprised when our skin heals after a cut or a fracture heals after a trauma. Although the potential and rate of healing slows down with aging, it certainly does not disappear. Tissues heal/"regenerate" even in the most elderly patients of our population, for instance, cuts heal, fractures heal, etc. Thus, there is an intrinsic capability of healing in humans that can be harnessed in the treatment of injuries and disease. There are multiple ways this healing can occur, including nutritional approaches, rest with a gradual application of exercise, modalities, invasive measures, and, at times, surgical intervention [3-6].

In the specialty of physical medicine and rehabilitation, there are several methods that have been used to "turn on" or facilitate this regenerative response, including range of motion and stretching exercises, strengthening exercises, cross-fiber massage, eccentric overload training [7], and many other techniques that have been validated to assist/enhance recovery from injury [8-13]. Other methods, such as acupuncture, have been used for centuries to promote an individual’s own healing response.

In the treatment of various orthopedic conditions, regenerative treatments recently have been advanced, including platelet-rich plasma and autologous stem cell therapy. The term orthobiologics has been used to describe these various biologic agents that are obtained directly from our bodies tapping into our own intrinsic capabilities to heal. Multiple studies on platelet-rich plasma have been published that demonstrate the healing capabilities of this treatment for chronic refractory tendinopathies [14-19] and the modulation of pain and inflammation in degenerative arthritis of the knee [20-22]. Slowly, studies are emerging that support the potential benefit of mesenchymal stem cells for cartilage disorders, including osteoarthritis, and in other musculoskeletal conditions [23-30].

The exact mechanism of what occurs after the placement of these biologic products in areas of injury is evolving, and the basic science evidence appears to point more toward enhancing the local environment and up-regulating the stabilizing and healing factors of the local tissues as opposed to replacing new tissue in the injured area. In essence, these biologic treatments represent the newest and exciting manner of inducing an individual’s own healing response.

To use a sports analogy, these biologic treatments are like a highly touted rookie who appears to have great potential and early promise. It is only with more time with a continual honing and refining of skills, repetition, and durability of success that one could call this athlete a “star” versus a flash in the pan, and so it is with these orthobiologic treatments. There is great hope (along with hype) that these treatments will result in a new paradigm of orthopedic treatment that facilitates tissue healing rather than the alteration, removal, and/or replacement of musculoskeletal tissue,
such as meniscal resection and joint replacement. Ultimately, it will be only through the refinement of treatment protocols and the publications of compelling results of the results of treatment that the medical community can accept their efficacy and clinical utility. In the end, these treatments represent a modern method of facilitating our own body's inherent capabilities of healing.

In this supplement, we have endeavored to present current theories, scientific evidence, and controversies in the area of orthobiologic treatments, including regulatory issues regarding the proper use of these treatments; the evidence for and against the various sources of stem cells; methods to properly obtain and measure the biologic products that are concentrated; the current literature regarding the evidence for biologics in orthopedic conditions and the role of the physiatrist in this emerging area of orthobiologic treatments; and finally, ethical issues associated with these new treatments. A Point/Counterpoint will provide a clinical scenario that debates the evidence for and against these treatments. I am pleased to work in conjunction with these outstanding authors in providing this supplement to the Journal. It is clear that we are only at the beginning in understanding and properly introducing these treatments into clinical practice. The physiatrist who cares for patients suffering from various orthopedic conditions should be aware of the medical evidence and how to consider orthobiologic treatments among the many other nonoperative strategies to optimally maintain maximal function in these patients.

References


Disclosure

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Disclosure: nothing to disclose