

## **CYTORI: New Approach on Regenerative Treatments with ADRC**

The nature of basketball is such that most players will experience some kind of injury to their ankles, knees, or hips at some point in their careers. A study of NBA basketball players over a 17 year period, 1988–2005, found that lower limb injuries accounted for over 60% of injuries[1]. The same study showed that injuries to the cartilage or ligaments of the knee or ankle account for four of the five largest causes of games lost to injury amounting to over 22,000 player games lost during the study period.

For injuries such as ankle sprains and meniscal tears, return to the court is often delayed or halted due to the frequent inability of ligaments and cartilage to heal spontaneously. This arises from their relatively limited blood supply, which restricts the delivery of cells, nutrients, and growth factors necessary for effective repair and their intrinsically low metabolic rate. In other injuries, particularly inflammation of the knee (patellofemoral inflammation), which is the single largest cause of games lost [1], the problem is not an acute injury from a fall or twisted ankle, but rather a consequence of progressive, repeated wear and tear. Indeed, this problem has been described as the “silent endemic” among professional basketball players on the basis that it progresses in multiple, small increments rather than in a single season-ending event [2]. Whether the problem is the naturally slow healing process or the effects of chronic inflammation, there is considerable potential in alternative and supplemental approaches that may improve outcomes, getting athletes back onto the court sooner with reduced risk of re-injury.

Regenerative Medicine is an emerging field in which biologically active agents, such as growth factors and cells, are applied to injured tissue in an effort to engage the body’s natural healing mechanisms. One avenue for this is the use of the athlete’s own adult stem and regenerative cells. In this approach, cells with regenerative properties are obtained from the athlete’s own fat tissue or bone marrow and placed in culture to grow a population of stem cells that are then injected into the site of injury. One challenge with this approach is that the cell culture needed to grow the cells takes so long that, by the time the cells are ready for treatment the injury has progressed well beyond the acute phase where greatest good can be achieved, and the player is often kept off the court for the duration of this process.

However, recent data show that cell culture may not be necessary when using the cells from patient’s fat tissue because it is such a rich source of stem and regenerative cells. For example, several preclinical studies have shown that cells obtained from fat and then injected immediately, without any cell culture, improve healing in cartilage, muscle, and tendon injury [3-7]. This promise has been confirmed in early clinical trials in patients with chronic inflammation of the knee associated with progressive cartilage damage, a condition that has many similarities with patellofemoral inflammation [8-10]. As a result, interest in use of Adipose-Derived Regenerative Cells (ADRCs) in sports medicine is growing. Indeed, the American company, Cytori Therapeutics Inc. has recently announced FDA approval to start a clinical trial of ADRCs prepared using their Celution® System in patients with hamstring injury (clinicaltrials.gov identifier NCT02045888) and is conducting a sponsoring a registry in Europe with the same indication. One interesting side note

from use of a patient's own ADRCs is the potential for athletes to set aside and bank their ADRCs during the off-season so that they are available for immediate use in case of future injury.

Few will deny the considerable promise of Regenerative Medicine, though it is still developing. Good quality clinical data is appearing in the scientific and medical literature on a weekly basis. The popular press and internet contain multiple stories of athletes and non-athletes undergoing stem cell treatments. Much of this information is clearly anecdotal at best and there are many ethically questionable persons offering dubious stem cell treatments. At the same time, there are many well-qualified clinical investigators working within appropriate legal, regulatory, and ethical structures performing robust studies that are offering strong data. Basketball players, and all athletes, should keep themselves informed on this progress in order to ensure that, should they need treatment, they have the information needed to make the right choices.

## References

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