

## The Three Phases of Healing

In this edition I am returning to the basics. I've been treating injured patients for so long that I take for granted that everyone is familiar with the fundamental scientific principles surrounding connective tissue healing. From the 30,000 foot view, probably the most important concept to understand, after we accept that an injury has occurred, is the concept of wound healing.

As it relates to connective tissue repair, the healing process is triphasic including an acute inflammatory phase, a repair phase and a remodeling phase. While these three phases are defined individually they represent a progression over time with a significant degree of overlap. The physician's understanding of these phases will assist in the treatment design and ultimately in the determination of prognosis and, if appropriate, a permanency determination. An understanding of these phases by attorneys and lay people will help them appreciate realistic treatment time frames and reasonable outcome expectations.

### **Phase I: Acute Inflammatory Phase - 0 to 72 hours**

In this phase we see the four cardinal signs of healing (redness, swelling, heat, pain or in Latin rubor, tumor, calor and dolor). This begins when the capillaries of the cells are damaged and their walls leak fluids (transudates and exudates). Some of the cells in the exudates transform into macrophages which are cells that function to phagocytize or "eat" waste products of connective tissue damage. These cells also produce collagenase and other enzymes that attract fibroblasts and capillary regrowth factors which support repair. Healing in this phase takes place by fibrotic repair and is not well organized. Interestingly, the cellular repair process can be inhibited by the use of NSAIDS and corticosteroids, specifically because they interfere with the cellular processes that are required to optimally lay down the foundations of repair.

### **Phase II: Repair Phase - 48 hours to 6 months**

In this phase there is the development of collagen by the fibroblasts. This collagen is the "plaster" that is used to establish a connective tissue matrix which will consolidate and contract ("dry") early on (3-14 weeks), but may continue for up to 6 months. There is a constant growth and breakdown process as tissues reorganize but with a dominance of growth. It is essential that the tissues are sufficiently tensioned to promote organized healing (e.g. ranges of motion, gentle manipulation, etc). The properly applied forces of active exercises and passive mobilization assure optimal tissue repair. However, because this repair is a work in process, it is essential that the body is not pushed beyond its limits resulting in re-injury or suboptimal repair. As an example, at 3 weeks the tissues are only 15% their normal strength. Therefore, premature return to prior physical demands may limit proper healing.

### **Phase III: Remodeling Phase – 3 Weeks to 12 months**

This phase is all about the reorganization of the resulting scar from the first 2 phases so that the tissue is as close to resembling the original tissue as possible. Of course, even the best repair process cannot result in tissue integrity equal to the original tissue. This is not unlike an auto body repair. It may look great until you look under the car and find that there is bondo and streaks or structural flaws. It may look fine but it will never be the same again. With ligaments that have been stretched beyond their limits, there is a permanent plastic



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deformation which subjects them to hypermobility which overtime has been reported to result in joint degeneration and osteoarthritic changes. This has been referred to as ligamentous sub-failure, where the ligaments appear intact but actually lack the previous structural and mechanical integrity. Of course, the density of scar tissue results in the body's greater attempts at repopulation of nerves to the area and this in turn results in a decreased pain threshold in the repaired tissue. This process explains the higher rate of re-injury and lowered pain threshold in damaged joints and their related connective tissue structures.

Using these healing principles, doctors can reasonably assume that a patient will reach optimal repair sometime between 6 and 12 months, with or without active treatment. The quality of the healing will be directly related to the degree to which healing is supported by prompt and proper medical, chiropractic and physical therapy approaches. It will be confounded by factors like co-morbidities (diabetes, obesity), nutritional deficiencies, premature physical demands and many others. This means that after the patient has demonstrated stability in their presentation for several data points, a determination as to their outcome can be determined. It should be noted that not every connective tissue injury will result in impairment. There needs to be sufficient damage so that the cumulative effect is measurable and consistent. Experienced rehabilitation doctors, like ours at the Shaw Chiropractic Group, know how to assess and document appropriately so an accurate outcome determination can be prognosticated and reported.

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