

PHASES OF HEALING

Mandatory Knowledge

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LEARNING OBJECTIVE

- Understand Phases of Healing in Musculoskeletal Trauma

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LEARNING OBJECTIVE

- Apply Phases of Healing knowledge in the evaluation and treatment of musculoskeletal complaints / injuries

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LEARNING ACTIVITY

Patient is 9 months status post MVC with chronic cervicothoracic pain and headaches. The patient has undergone 4 months of passive modalities, spinal manipulation and myofascial release. He has also undergone 2 months of acupuncture.

- Think of a relevant treatment plan or referral for this individual.

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WOUND HEALING

- Body's replacement of destroyed tissue by living tissue (Walter and Israel, 1987).
- Two Essential Components:
  - Regeneration
  - Repair



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TWO COMPONENTS OF WOUND HEALING

REGENERATION

- Specialized tissues are replaced by the proliferation of surrounding undamaged specialized cells.

REPAIR

- Lost tissue is replaced by granulation tissue which matures to form scar tissue.

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**PHASES OF HEALING**

- Phase – A distinct period or stage in a process of change or forming part of something's development.
- Healing – The process of returning to health: the restoration of structure and function of injured or diseased tissues.

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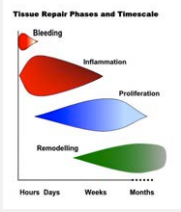
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**PHASES OF HEALING**

- Phase I: Acute Inflammatory Phase
  - 24-72 Hours
- Phase II: Repair Phase
  - 2-6 Weeks
- Phase III: Remodeling Phase
  - Up to 40 Weeks
  - does not indicate that treatment should be continued for up to 40 weeks. This does mean that each patient should be instructed in and eventually transitioned into a home based stretching / strengthening program.



The diagram shows three overlapping bell-shaped curves representing the intensity of different healing phases over time. The x-axis is labeled 'Hours Days Weeks Months'. The first curve (red) is 'Bleeding', peaking early and ending by day 72. The second curve (blue) is 'Inflammation', peaking around day 3-5 and lasting about 2-6 weeks. The third curve (green) is 'Proliferation', peaking around week 2-3 and lasting up to 40 weeks. A fourth curve (dark green) is 'Remodelling', which starts late in the proliferation phase and continues for months.

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**BLEEDING PHASE**



The graph plots 'INTENSITY' on the y-axis against 'HOURS', 'DAYS', 'WEEKS', and 'MONTHS' on the x-axis. It shows four horizontal bars representing the duration of different phases: 'Bleeding' (shortest, within hours), 'Inflammation' (days), 'Proliferation' (weeks), and 'Remodelling' (months).

- Short lived phase following trauma
- More vascular tissues (e.g., muscle) will bleed longer than less vascular tissues (e.g., ligaments) in terms of duration and volume.

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### INFLAMMATORY PHASE

- Rapid Onset
- Zenith of inflammatory response occurs between 3-72 hours.
- Characterized by pain, swelling, redness and localized increased temperature.

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### REPAIR / PROLIFERATION PHASE

**Acute Inflammation**

↓ 72 hours

**Regeneration**

↓ 72 hours to 6-8 weeks

**Remodeling**

↓ 6-8 weeks to 6-12 months

**End of Healing**

- Generation of repair material
- Involves production of scar (collagen) material
- Rapid onset (24-48 hours)
- Peaks between 2-3 weeks
- Bulk of scar tissue formed

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### REMODELING PHASE

**Acute Inflammation**

↓ 72 hours

**Regeneration**

↓ 72 hours to 6-8 weeks

**Remodeling**

↓ 6-8 weeks to 6-12 months

**End of Healing**

- Often overlooked
- Should result in organized and functional scar which is capable of behaving in a "similar" way to the parent tissue.
- Typically starts at peak of proliferation phase (2-3 weeks)
- Continues up to 40 weeks

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PHASES OF HEALING  
ACUTE INFLAMMATORY

Vascular and Cellular Events

- Increased vessel caliber (blood flow) and vessel permeability.
  - Electrolytes, proteins, leukocytes, monocytes and neutrophils
  - Swelling causes pressure on nerves, resulting in pain response.
- Neutrophils and polymorphonucleocytes (PMN's) are "first responders" and begin phagocytic processes.
- Monocytes (macrophages), along with the edema act as the "clean up crew" and remove debris.
- Extent of response is proportional to the severity of injury.

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PHASES OF HEALING  
ACUTE INFLAMMATORY

Treatment

- PRICE – Protect, Rest, Ice, Compress, Elevate
- NSAID Therapy
- Physiotherapy Modalities
  - Interferential current (acute)
  - Cryotherapy (2-5 days)

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PHASES OF HEALING  
REPAIR (REGENERATION) PHASE

- Involves the formation of collagen, which bridges the gap created by necrosis of tissue.
  - Scar tissue
  - Adhesions
- Typically lasts up to 6 weeks and is dictated by severity of the injury.

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PHASES OF HEALING  
REPAIR (REGENERATION) PHASE

Treatment

- Manual Manipulation
  - Intra-articular adhesions
- Deep Tissue Myofascial Release
  - Extra-articular / Myofascial Adhesions
- Passive modalities
  - Interferential Current (subacute)
  - Heat / Ice Contrast
    - Progressing to Moist heat

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PHASES OF HEALING  
REMODELING PHASE

- Importance of this phase is often overlooked by practitioners.
- Does not occur or resolve quickly, may last up to 1 year.
- Appropriate treatment results in more organized and functional scar tissue.
- Initial Type III collagen can be replaced with Type I collagen. Post-injury tissue will not match the pre-injury tissue strength.
  - Type III is made up of weak fibrils with random orientation
  - Type I has greater tensile strength and has more cross linkages.

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PHASES OF HEALING  
REMODELING PHASE

Treatment

- Active Rehabilitation aimed at increasing
  - Strength
  - Endurance
  - Flexibility
  - Posture and Body Mechanics
- Manual Manipulation
- Deep tissue myofascial release
- Orient scar tissue along lines of stress for maximum functionality.

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**HOME REHABILITATION?**

Days Per Week	Number of Days
None	6.5
1-2 Days	5.5
3-4 Days	4.5
5-6 Days	3.5
7 Days	2.5

- Experiences with patient compliance?

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**TECHNICAL OFFICE REHABILITATION**

- Cervicothoracic
- Lumbar / Core

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**LOW TECH OFFICE REHABILITATION**

Must document what rehab the patient is doing...

**FIVE MINUTE PLANK**  
NEHA REY WORKOUT @ reilibrary.com

1. 60sec full plank
2. 30sec elbow plank
3. 60sec raised leg plank  
30 seconds - each leg
4. 60sec side plank  
30 seconds - each side
5. 30sec full plank
6. 60sec elbow plank

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LEARNING ACTIVITY

Patient is 6 months status post MVC with chronic cervicothoracic pain and headaches. The patient has undergone 4 months of prior chiropractic care.

Prior treatment: Passive modalities, spinal manipulation and myofascial release. He has also undergone 2 months of acupuncture.

- Devise a relevant treatment plan for this individual or relevant recommendations.

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