Massage and the Inflammatory Process

p. 233 in Rattray

The inflammatory process is a necessary step towards the healing of injured tissue.

- The healing process is divided into several stages referred to as acute, early and late sub acute and chronic
- Therapist must rely on his/her palpation skills to determine method of treatment not strictly the amount of time that has elapsed since the injury.
- The ultimate goal of treating injured tissue is to promote a strong mobile scar and as much full and pain free movement as possible

Inflammation

- Is an immediate, local response to injury and tissue damage
- The acute stage allows the tissue to heal and infections to resolve with the help of the immune system
- The causes of tissue damage can be internal or external
- Common causes are trauma, infection, surgery, immune responses, extremes of heat or cold, chemical or radiation damage

Types of Healing

- The point of the healing process is to restore the integrity of the tissue
- Sometimes there is simple replication of the missing cells (rare)
    - If the damage is superficial involving only the epithelial layer of tissue healing will occur through regeneration of this tissue (re-epithelialization)
    - There is no scar tissue
    - Re-epithelialization is possible with epithelial tissue as well as nerve and hepatic cells
    - If excess exudate occurs, some fibrosis in the tissue will result
- With most types of tissue structure is created using scar tissue
    - When there is increased loss of epidermal and dermal tissue layers, or damage to muscle, tendon and ligaments, healing results from the synthesis of new tissue
    - The repair process requires the production of connective tissue made of collagen fibers to replace the area where tissue loss or damage has occurred
    - This restores the continuity of the affected structure with a different type of tissue
    - Collagen repair is commonly referred to as scar tissue
- Primary (first intention) Healing
    - Occurs when there is some tissue loss and the wound edges are approximated
    - Approximation may be done with the use of tape, stitches or staples
    - Healing is efficient with only a small amount of collagen produced
- Secondary (second intention) Healing
    - Results when there is extensive tissue loss or a large surface area affected
    - The wound edges can not be brought together easily
    - Healing takes longer through extensive re-epithelialization as well as production of a large amount of granulation tissue

Inflammatory Process

ACUTE STAGE

- Time frame is a short stage at the moment of injury and lasts up to 3 – 4 days post injury
- This is the beginning stages of healing
- Symptoms are redness, swelling, heat, pain, often loss of function accompanied by muscle spasm and guarding, if bruising is present it is black, blue, red, or purple
- When an injury occurs an initial vasoconstriction is followed by vasodilation
- Observable redness and palpable heat are due to dilation of local blood vessels
- Swelling is caused by the fluid leaking into the interstitial space due to increase permeability of the blood vessels
- The permeability is due to the release of histamine (chemical mediator)
- Pain is secondary to muscle spasm and well as irritation and compression of local nociceptors (due to swelling)
- Loss of function can follow if the injury and swelling are severe
- Muscle spasm and guarding can contribute to loss of function as the body attempts to immobilize injured area
- Cellular level
    - Platelets play several roles, they cause coagulation of the blood which reduces blood loss, isolates the injury and prevents or reduces bacterial infiltration
    - Platelets combines with fibrin and other cells form a strong clot to occlude the damaged site
    - These cells also release chemotactic agents for the attraction of leukocytes
    - Several types of leukocytes migrate to the injured area and clean the area of bacteria and foreign debris, indirectly attract fibroblasts, stimulate the proliferation of fibroblasts and regulate collagen synthesis
- The inflammatory process begins to resolve at the end of the acute stage, if the tissue damage is severe the inflammatory process will continue which will increase the collagen formation and lead to additional adhesions

Treatment Considerations

- Assess the injury
- Treatment goals are to limit the inflammatory process
- Reduce pain and swelling
- Decrease sympathetic nervous system firing
- Prevent re-injury
- Protective spasms are reduced but not removed
- Compensatory structures are also treated
- Position of the client should be for their comfort (if unsure ask how they sleep)
- Hydrotherapy is cold application
- Remember the term ”RICE” rest ice compression elevation

Massage

- Pain is reduced and increase client comfort and relaxation on unaffected areas of the body
- Passive movements are performed on unaffected joints to maintain range of motion
- Treat any compensating structures
- Reduce any swelling that is contributing to pain and decreased movement

- Affected area is elevated and cool hydrotherapy is applied
- Pumping of relevant lymph nodes is followed with lymphatic drainage proximal to injury site
- All modalities are applied with care, to not further compromise the client

Contraindication
- No lymphatic drainage or circulatory stokes done at the site of injury or distal to
- Passive movement may not be tolerated for affected joints or the joints that the tissue crosses
- Do not completely reduce muscles spasms local to the injury site

Self Care
- Limit active movements due to local pain, swelling and muscle guarding
- With moderate to severe acute injuries, immobilization may be insured through wrapping, splinting or casting
- In less severe cases limited pain free active movements is encouraged
- Active movements is used in the uninjured tissue

SUB-ACUTE
- Usually occurs within 2 days and continues for up to three weeks after the injury but can last for as long as six weeks
- The sign of inflammation diminish over time
- Wound closure takes an average of 5-8 days with muscle and skin injury and 3 – 5 weeks with tendon and ligament injuries
- There is gradual restoration of the damaged structures

*EARLY SUB-ACUTE
- This stage occurs within 2 days of injury and can continue for up to a few weeks
- The affected area shows diminishing signs of inflammation, with pink, warm, slightly swollen and somewhat less painful tissue
- Muscle spasms diminish
- If bruising is present it is relatively unchanged from the acute stage
- Pain is experienced when tissue resistance is encountered in range of motion
- The primary process of this stage is to fill the damaged area with new tissue
- Re-epithelialization
    - Only applies if the skin is damaged
    - Epithelial tissue begins to regenerate
    - First the cells of the epidermis to the edges of the wound
    - This is followed a few days later by proliferation of cells at the edge of the wound or within the wound from hair follicles or sweat glands
    - The duration to complete this process varies depending on the severity of the wound
- Granulation Tissue
- The formulation of granulation tissue is part of any tissue repair where there is first or second intention healing
- There must be adequate supply of blood and nutrients
- Fibroblasts are important because they synthesize collagen fibers that form loose connective tissue matrix in the area of tissue loss
- Matrix replaces the clot which developed in the acute stage
- The resulting vascular connective tissue is referred to as granulation tissue

Treatment Consideration

- Assessment is performed
- Treatment goals continue to decrease the effects of inflammation, pain, swelling and spasms while maintaining available range of motion and strength
- General treatment is the same as in the acute stage
- Therapist may begin to treat peripheral tissue but not distal to the lesion
- Hydrotherapy includes cool applications and the introduction to contrast applications

Massage

- Started with elevation of the affected area
- Cool hydrotherapy is used followed by lymphatic drainage techniques
- Swedish techniques are proximal to the injury site
- Trigger points on muscles that refer to the injury site can be treated
- Techniques to reduce spasm are used
- When treating the surrounding tissue to the injury site the techniques must be directed toward the injury to lessen the drag of the healing tissue
- Hand can be placed just proximal to the injury site to create a barrier if techniques that create excess drag are performed
- Therapist must take extra care to not damage the newly healed tissue
- Distal to the injury only gentle stroking and muscle squeezing are performed to avoid congestion at the lesion
- Passive movement if full range is applied to the unaffected joints
- Affected joints are slowly moved a few degrees and up to midrange of pain free motion to maintain range of motion

Self Care

- Variety of pain free range of motion is encouraged
- Strength must be maintained though isometric contractions
- Client is instructed that is inflammation is increased due to exercises given, they should decrease the intensity and frequency of exercise

*LATE SUB-ACUTE

- Begins approximately the 2nd to 3rd week of sub-acute stage
- There could be a possible pocket of swelling
- Minimal discomfort is experienced but with potential loss of range of motion due to adhesions and muscle weakness
- Extra blood vessels that have formed retract
- Bruising that is present has changed to yellow brown or green
- Pain is encountered with over pressure to the affected tissue
- Wound Contraction
    - Myofibroblasts, cells found within the wound matrix, contain contractile fibers
    - They generate isometric / isotonic contractions of the tissue
    - The purpose of the wound contraction is to speed the healing process because less scar tissue is needed to fill the smaller damaged sites
    - This process peaks at about 2 weeks after injury but can continue to the late sub acute stage

    - Wound contraction can result in deformation of tissue and possible dysfunction
- Scar Remodeling
    - Reshaping and reorganizing of the healing tissue begins as existing collagen is broken down, new collagen is synthesized and cross links develop among the collagen fibers
    - Strength of the site begins to increase
    - It is dependent on the amount and type of collagen, the number of cross links and balance between collagen synthesis and breakdown
    - If an abnormal amount of connective tissue fibers are laid down following the trauma or during immobilization adhesions begin to form
    - As a result tissue layers stick together and range of motion is reduced

Treatment Considerations
- Assessment is performed
- Treatment goals include decreasing any remaining swelling, reducing trigger points, pain and adhesions and improving range of motion and muscle strength
- Relaxation massage is performed and attention is placed on compensating structures
- Hydrotherapy application of hot and cold contrast are indicated

Massage
- Pockets of edema are treated
- Swedish massage techniques are performed over the entire affected limb both proximal and distal to injury site
- Trigger points in proximal and local tissue are treated
- Massage to the injury site begins peripherally and proceeds in a systematic manner centrally
- Techniques to break down adhesions are performed (fascial techniques)
- Gentle frictions are performed on specific adhesion sites
- All deeper techniques are modified for client tolerance
- Prolonged stretch is applied to scar tissue
- Frictions are performed to scar tissue
- Cold hydrotherapy is applied after techniques that create lasting hyperemia
- Effleurage and other flushing techniques are performed after these more vigorous techniques
- Passive range of motion is applied at mid range working towards achieving full range
- Joint play is used to prevent adhesions within the affected joints and mobilize hypomobile joints

Self Care
- Remedial exercise includes stretching and strengthening
- Passive stretches and PIR are used to encourage alignment of scar tissue
- Strengthening progresses from full strength isometric contractions to isokinetic exercise
- Client should monitor the intensity of the exercise and the amount of soreness post exercise and alter appropriately

CHRONIC
- This stage over laps with the later stages of late sub-acute stage at about 2-3 weeks post injury and continues for up to 1 – 2 years
- The inflammatory process is resolved
- There is likely no swelling
- There is loss of full range of motion and a decrease in function

- Pain may occur in affected tissue with over pressure or secondary to stress placed on contracted tissue
- Scar tissue continues to remodel and reorient in response to tissue stresses
- Alignment of collagen fibers is influenced by stretching and active movements
- During this stage the scar tissue strengthens dramatically, at maturity the scar tissue is only 70 – 80 % as strong as the tissue it replaced
- Chronic Inflammation
- Can result of repeated micro trauma, inflammatory arthritides or other irritating agents
- Can last for weeks to years
- It is not characterized by the cardinal signs of inflammation though pain, swelling and muscle guarding may occur after activity
- Stiffness may be experienced after rest
- There is a proliferation of fibroblasts and new, immature collagen fibers
- This leads to an increase risk of excessive scarring and loss of motion and weakness

Treatment Considerations
- Assessment is performed
- Treatment goals are to reduce restrictive adhesions and trigger points and restore range of motion and strength in the affected area
- Compensating structures are treated as well
- Hydrotherapy includes contrast application or hot application

Massage
- Techniques are used to reduce adhesions, increasing the intensity of technique
- Prolonged stretch to scar tissue after friction technique is performed, then cold application is applied
- Trigger points, hypertonicity and fascial restrictions are addressed
- Joint play is applied to hypomobile joints to increase mobility

Self Care
- Stretching and strengthening exercises
- Endurance and cardiovascular exercises are encouraged

Factors that Affect the Healing Process
- Severity of the injury
- Age of person
- Presence of infection
- Presence of foreign material
- Nutritional support
- Existing conditions
- Adequate blood supply
- Wound separation
- Effects of some drugs
- Smoking