

***Soft tissue***

Assorted sources

* We develop from roughly the same cellular structure as the original ovum during embryological growth via cellular division. These cells then divide and differentiate into specialized types (along with stem cells). These specializations can be secretion, conduction, contraction or support.
  + Cells basically make a decision as to what structure they end up becoming.
  + Respond to chemical signals from other cells based on the perception of tension
  + Reorganize themselves along lines of perceived stress (mechanotransduction)
* For the purposes of this class, we will be spending most of the time discussing contraction and support, although conduction—transportation of messages, sensorium, experiences--should be always considered as an underlying mechanism as to what is being accomplished via manual techniques.
* Connective tissue
  + Support, connections, anchor and framework
  + A matrix provides the framework for all connective tissue and is comprised of fluids (mostly), fibers and solids (remember helices) and act as a continuum
    - Forms a “fascia net”, aka collagenous network, extracellular matrix (ECM)
    - Directs fluids, creates the pockets & tubes, binds cells in the body neighbors
    - Fibers are collagen, reticular and elastic
      * Collagen is the fiber that provides strength/resists pulling forces.
        + Most common protein in the body
        + It cannot be stretched
      * Reticular provides shape and support of the soft tissue
      * The elastic fiber provides resilience (like a rubber band)
    - Also filled with “ground substance” which is a gluey intrafibrillar protein in the intercellular matrix
    - The types of connective tissue are: blood, loose connective tissue, dense fibrous, cartilage, bone and muscle
      * Blood is 60% plasma & 40% formed elements (cells & cell fragments)
        + Connects (communication) one part of the body to another, transport substances, fight infection and aid in tissue repair
      * Loose connective tissue is the body’s packaging material providing cushion, support and packing.
        + It is comprised mostly of fluid and a little protein
        + Areolar, adipose and reticular
      * Dense fibrous connective tissue provides strength and support
        + Comprised mostly of protein and a little fluid
        + Classified based on fiber orientation

Irregular

no orientation (i.e. dermis of skin)

Regular

parallel fibers (i.e. ligaments and tendons)

Elastic

Dense, strong (ligamentum nuchae/flava)

* + - * Cartilage
        + Hyaline, elastic and fibrous (or fibrocartilage)
      * Bone
        + Compact (cortical) or cancellous (spongy)
      * Muscle
        + Elastic, fluid filled
* Nature follows the path of least resistance
  + Straight lines most efficient way (there are none in the body)
  + Triangles are most efficient structure with lines (always bending and morphing)
    - Pyramids are 3D, tetrahedron are 4D
  + Stacking triangles = helix
  + Structure moves around a fixed point to evenly disperse stress and tension
    - Most efficient—remember survival
    - Tension always exists, despite lengthening or shortening
* Tubes
  + All over the body
  + Crossed helical most prevalent to allow for expansion and compression
    - Blood vessels, muscles, fascia, bones, nerves
  + Creates fascial networks like tensioned cables designed to redistribute stress among the entire system.
    - Concept most commonly referred to as tensegrity, further elaborated to be called biotensegrity.
      * The property of a skeletal structure having continuous *tension* members providing *integrity* and discontinuous compression members so that each member performs efficiently in producing stable form
  + This allows for the connective tissue to store energy—potential—which has a considerable influence on musculotendinous force production. Arguably even more then the contractile nature of the MT unit itself.
* Fascial tissue is plastic when exposed to repeated stress. Slowly stretch its shape repeatedly and it will deform and not return to its resting length. Fascial plastic deformation is not completely understood. Given time and apposition of the fibers it can lay down new fibers which will rebuild the area.
  + This is not the same as elastic recoil of tissue.
* Muscular and/or tendinous overuse/misuse creates a toxic environment for contractility and through interventions aimed to address this, it can help restore this process.
  + This requires:
    - a reopening of the tissue in question, to help restore fluid flow, muscle function and connection with the sensory motor system
    - an easing of the biomechanical pull that caused the strain on the tissue to begin with

**References**

Anatomy Trains (Thomas Myers), various course notes, <https://www.slideshare.net/Firedemon13/connective-tissue>