The Muscular System 10

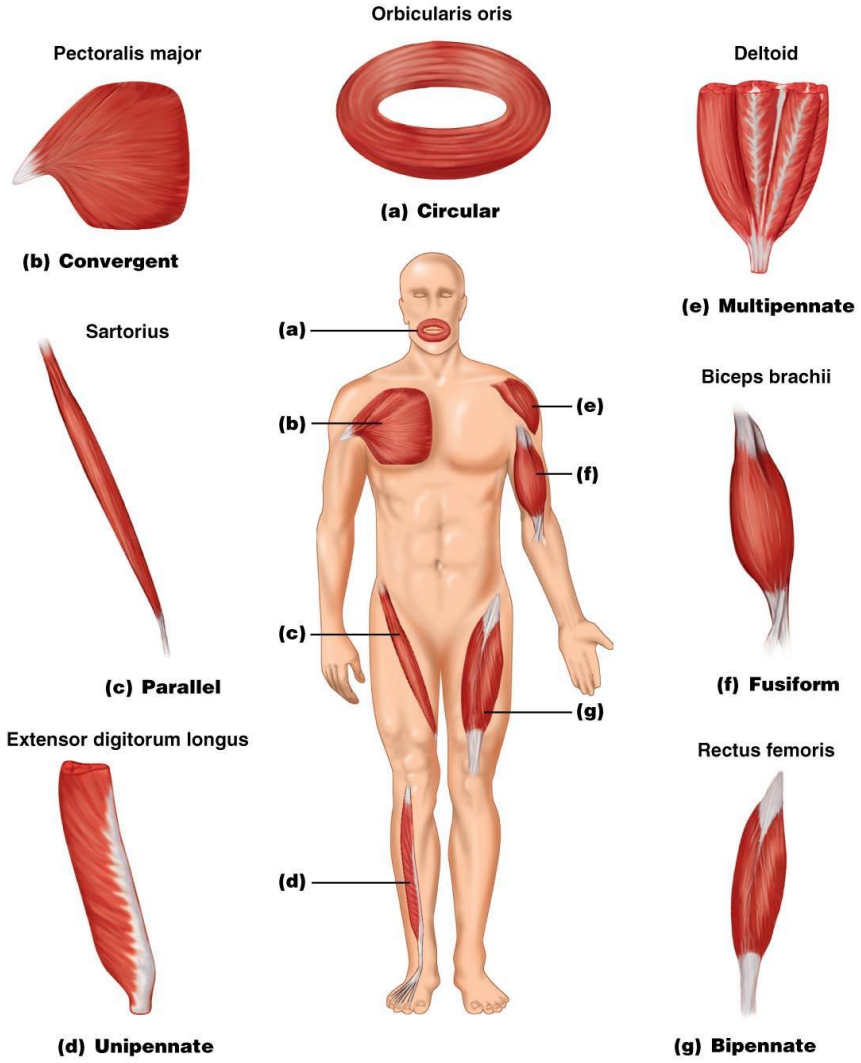
Muscle Mechanics: Importance of Fascicle Arrangement

Arrangement of Fascicles in Muscles

- All skeletal muscles consist of fascicles
- How the fascicles are arranged can vary → results in different shapes and functional capabilities
- Common patterns – parallel, pennate, convergent, and circular

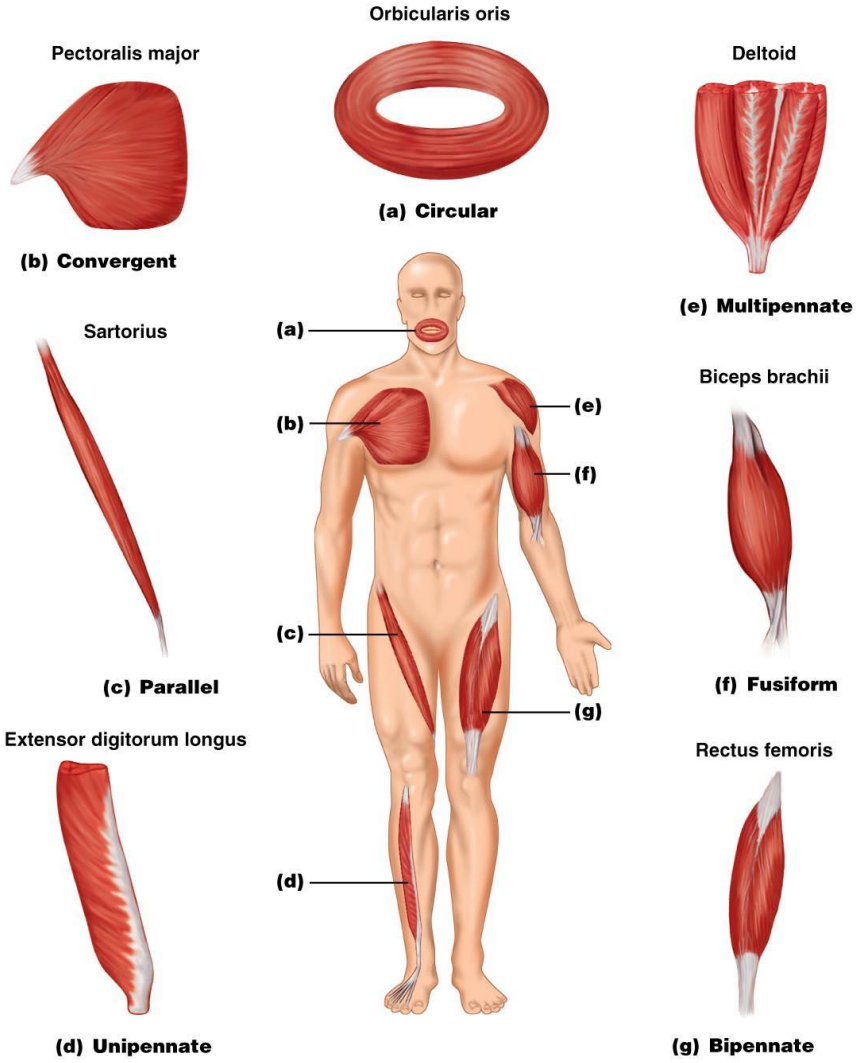
Arrangement of Fascicles in Muscles

- **Circular**
  - Fascicles are arranged into concentric rings
  - Surround external body openings
    - Close by contraction
  - Aka: sphincters (“squeezers”)
  - Ex: Orbicularis oris



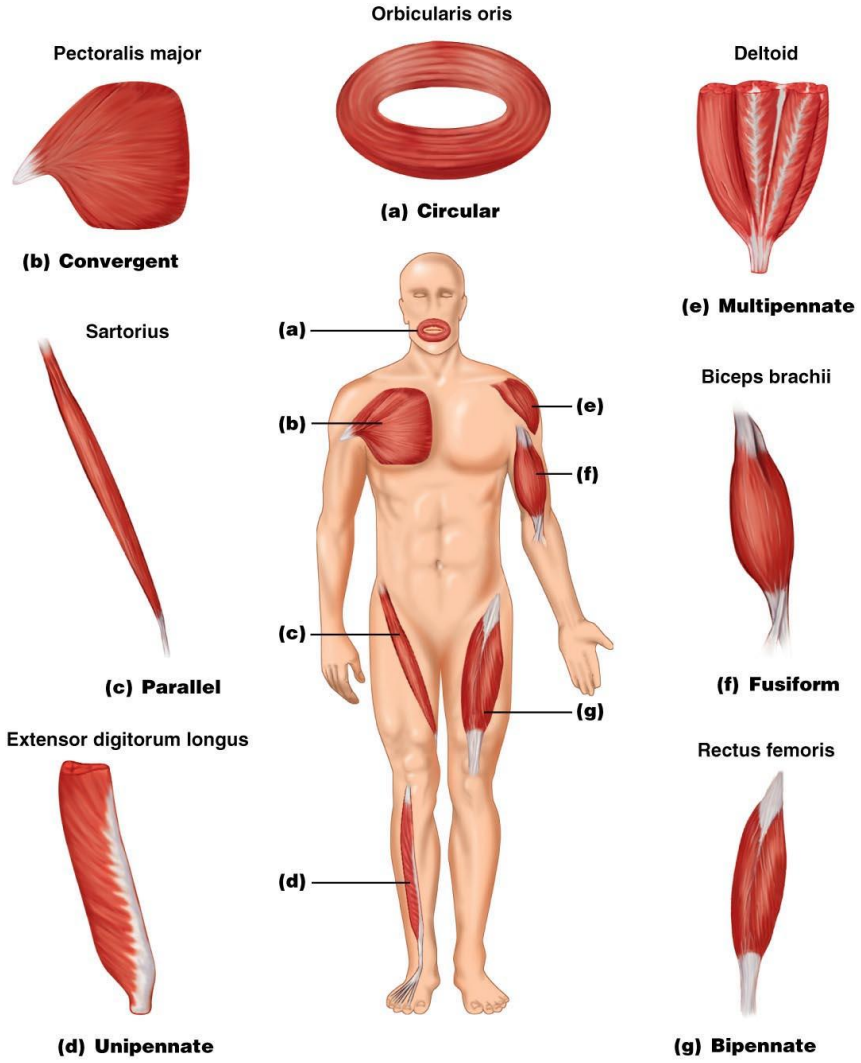
Arrangement of Fascicles in Muscles

- **Convergent**
  - Has a broad origin and the fascicles converge towards a single tendon of insertion.
  - Muscle is triangular or fan shaped
  - Ex: pectoralis major



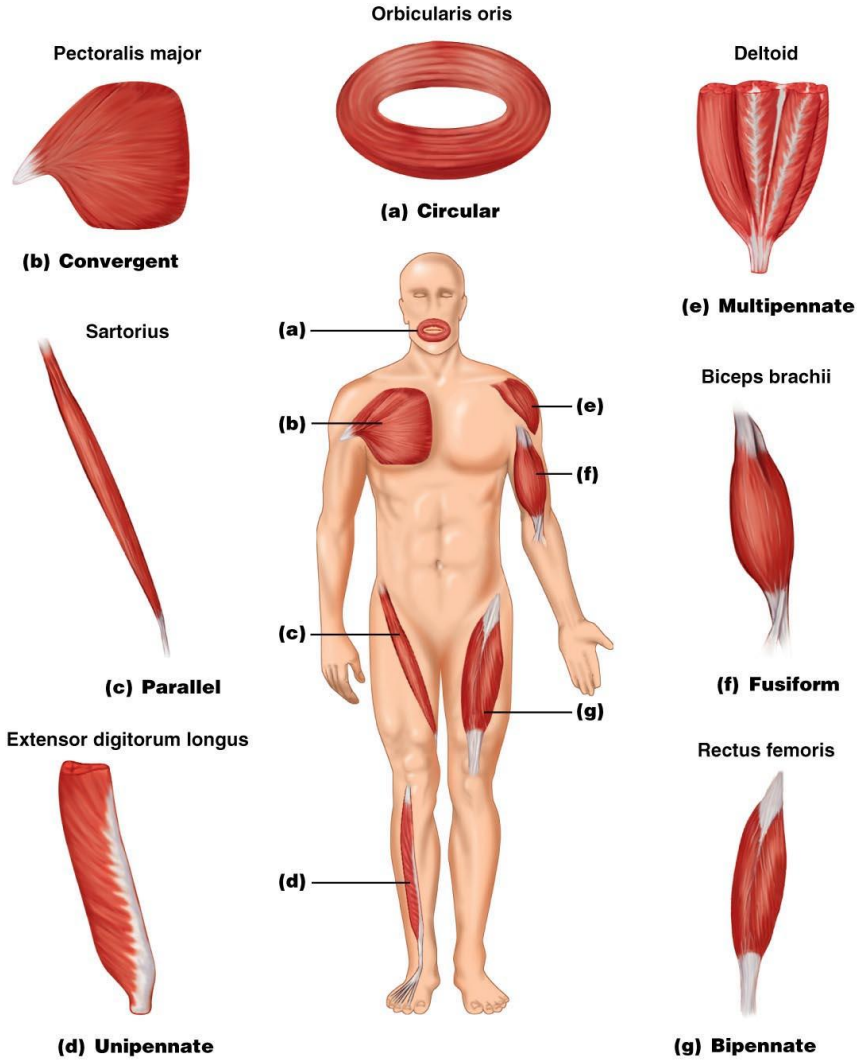
Arrangement of Fascicles in Muscles

- **Parallel**
  - The long axes of the fascicles run parallel to the long axis of the muscle
  - Straplike or spindle shaped (expanded belly of muscle)
- **Fusiform**
  - Spindle shaped sometimes classified separately



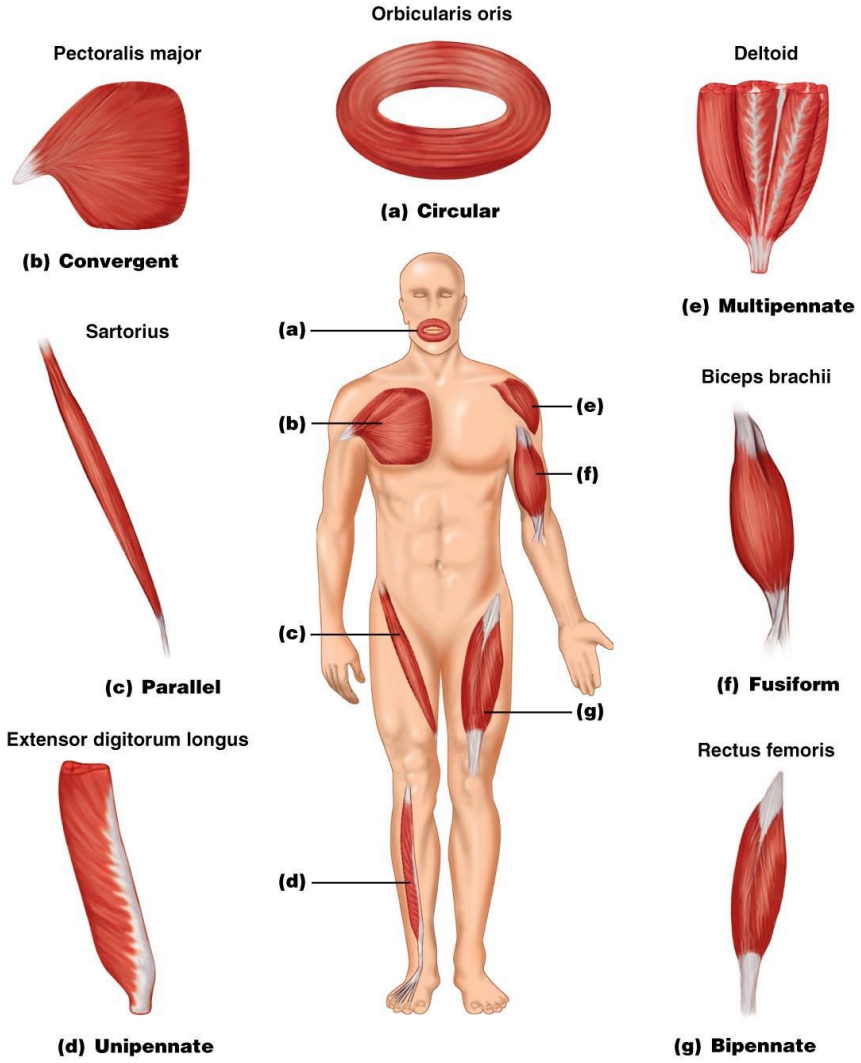
Arrangement of Fascicles in Muscles

- **Pennate**
  - Penna = feather
  - Short fascicles that attach obliquely to a central tendon that runs the length of the muscle



Arrangement of Fascicles in Muscles

- **Pennate** - Types
  - Unipennate
    - Fascicles insert into only one side of the tendon
  - Bipennate
    - Fascicles insert into the tendon from opposite sides
  - Multipennate
    - Fascicles attach obliquely from many directions to several tendons



Arrangement of Fascicles in Muscles

- The arrangement of a muscle's fascicles determines its range of motion and power.
  - Skeletal muscle fibers only shorten about 70% of their resting length
  - The longer and more parallel the fibers are → the more the muscle can shorten → usually not very powerful

Arrangement of Fascicles in Muscles

- Muscle power depends more on the total number of muscle cells in the muscle
  - The greater the number of fibers → the more powerful the muscle
  - The stocky bipennate and multipennate muscles → pack in a lot of fibers, shorten very little, but very powerful!