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Thumbs

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In 1964, Davis published a wonderful monograph describing the functional anatomy of the Giant Panda,[1] including a detailed description of the panda's "thumb." Although not a real thumb, this connective tissue pad and underlying bony anatomy functions as a thumb in helping to grasp bamboo: the mainstay of the panda's diet.

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Gould's 1980 volume, discusses various functional anatomical adaptations that have occurred in many different taxa over evolutionary time; chapter one discusses the panda's thumb specifically. As functional as this tissue is, it is a far cry from our opposable thumbs. One could, in fact, make the argument that our thumbs are one hallmark of being human - certainly our hands are the mainstay of the massage profession.

The thumb, or first digit, is made up of two phalanges and associated soft tissue. It is attached to the wrist at the first carpometacarpal (CMC) joint. This is a classic saddle joint where the base of the proximal first phalanx and the distal surface of the trapezium are reciprocally saddle-shaped. This allows for considerably more degree of motion than found with any of the other four digits.

The motions allowed at this joint are flexion/extension; abduction/adduction; opposition/apposition/reposition; and circumduction:

- Flexion and extension take place parallel to the plane of the palm (in the coronal plane) and are carried out primarily by the flexors pollicis longus and brevis, and extensors pollicis longus and brevis, respectively. The opponens pollicis assist with flexion, and the abductor pollicis longus assists with extension.
- Abduction and adduction of the thumb occur in the plane at right angles to that of the palm (sagittal plane). These two motions are achieved by the abductor pollicis longus and brevis, and the adductor

pollicis.

- Opposition is the motion wherein the tip of the thumb comes into contact with the tip of any other digit on the same hand. If the thumb contacts any other portion of a digit, it is referred to as apposition. Humans are probably the only primates that can truly oppose their thumbs. There are some who have described true opposition in a few primates using the thumb and the second digit; all other primates can appose them. Opposition and apposition are achieved by the flexors abductors and the opponens pollicis; bringing the thumb back to the relaxed position is referred to as reposition.
- Circumduction is the movement that describes a cone with the apex at the first CMC and the circular opening at the tip of the thumb. This motion takes place by consecutively contracting the flexors, abductors, adductors and extensors.[3] The interphalangeal (IP) joint of the first digit is much like the IP joints of the other digits. The primary movements are flexion and extension carried out by the digital flexors and extensors.

The ligaments surrounding the first CMC are very important to the integrity and function of this joint. There have been five ligaments described.[4] These ligaments generally allow considerable motion, thus they are not as commonly injured as the metacarpophalangeal (MP) joint; however, the CMC is commonly affected by osteoarthritis. [5] The ulnar ligament of the thumb's MP is frequently stretched or torn. This has been referred to as "gamekeeper's" thumb (early gamekeepers used to dispose of farmyard fowl by placing the bird's neck between the thumb and forefinger and snapping the neck) or "bowler's" thumb.

Currently, the most common injury here is related to ski pole usage. At any rate, the injury is the result of a traumatic event that tears the ulnar collateral ligament when the thumb is forced into hyperabduction/extension. By gapping the MP joint using a valgus force, one sees a dramatic gap on the ulnar side of the joint. Splinting is indicated for a stretched ligament, and surgery for a torn ligament.[5]

Another common problem of the thumb is de Quervain's tenosynovitis.[5] This involves inflammation of the abductor pollicis longus and extensor pollicis brevis tendons within their tendon sheaths at the lateral (anterior) border of the anatomical snuffbox. Remember, the anatomical "snuffbox" is that region bounded by the tendons of the abductor pollicis longus and extensor pollicis brevis, laterally (anteriorly); and the extensor pollicis longus, medially (posteriorly). The radial artery runs along its floor; here, the artery's pulse can be palpated. Treatments of de Quervain's tenosynovitis include immobilization, steroid injections and surgery.

Back to the panda's thumb: Where did it come from? It seems to be a modification of the connective tissue overlying a modified sesamoid bone. We have two sesamoid bones associated with our first metacarpophalangeal joint. These bones serve as attachments of thenar muscles. The abductor pollicis brevis and flexor pollicis brevis attach to the lateral sesamoid and the proximal phalanx, while the two heads of the adductor pollicis attach to the medial sesamoid and the proximal phalanx. Both of these attachments continue on to the extensor hood, as well. It seems that over evolutionary time, some carnivore taxa had a more developed lateral sesamoid bone. This developed into a large sesamoid bone, as seen today in the Giant Pandas. Other mammals, like the raccoon, have sophisticated grasping function, but not nearly as sophisticated as ours.

Take good care of your thumbs. They serve you well.

References

1. Davis, D.D. 1964 The giant panda: a morphological study of evolutionary mechanisms. Fieldiana Memoirs (*Zoology*)3:1-339.
2. Gould, S.J. 1980 *The Panda's Thumb*, Chapter 1, pp 19-34.
3. Clemente, C.D. 1984 *Gray's Anatomy*.
4. Hollinshead, W. H. 1969 *Anatomy for Surgeons*, Vol. 3.
5. Snider, R. K. 1997 *Essentials of Musculoskeletal Care*.

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