IN BRIEF

Why I Take Pride as a Hand Surgeon?

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Abstract

From the intricate movements that allow us to create art, express emotions, and communicate with others to the tactile sensations that connect us to the world, hands play a vital role in shaping our experiences and interactions. Hand is the bridge between the man's imagination and the physical world, the conduit through which inspiration flows and ideas take shape. However, our hands' remarkable skill and precision didn't simply come into existence; it required significant changes in other body parts and biomechanics to accommodate and support them.

Level of evidence: V

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Introduction

Let us delve into some of the adaptations our bodies have undergone due to evolution in our genes towards upright posture, which enables us to use our hands. The utilization of hands in the manner observed in modern humans, with an emphasis on enhancing movement precision, dexterity, power, and range of motion, necessitated a crucial adaptation - the evolution of bipedalism.

Main body

Knees

Marking the liberation of our hands for intricate tasks imposes significant strain on our knees. The upright posture demanded by walking on two legs intensifies pressure on our knee joints, resulting in a heightened susceptibility to osteoarthritis compared to our quadrupedal ancestors.[1]

This evolutionary exchange underscores the delicate balance between the advantages of manual dexterity and the physical toll it exacts on our lower limbs.

Lumbar spine

In the lumbar region, the lower spine's concave curvature is a vital adjustment that aids in upholding our upright posture, yet it also makes us susceptible to back pain and degenerative spinal conditions. The lumbar region bears the burden of our vertical stance as we navigate the world, highlighting the evolutionary compromises ingrained in our anatomy.

Cervical spine

The other adaptation is cervical lordosis, the inward curvature of the cervical spine that facilitates mobility and stability. This curvature allows for a greater range of motion in the neck, enabling humans to perform various activities with their hands by looking around, tilting the head, and maintaining balance. However, this adaptation also increases the risk of degenerative diseases and discopathies over time. The forward-positioned foramen magnum, oriented downward rather than backward, is another notable anatomical feature of the human neck. This positioning aligns with the demands of bipedal locomotion, facilitating the balanced distribution of weight and minimizing strain on the neck muscles and ligaments. These anatomical adaptations highlight the intricate balance between mobility, stability, and structural integrity in the human neck.[2]

Hips

In the hip joint, the femurs' inward angling and the hips' curving stabilize our body's center of gravity, facilitating bipedal locomotion. Hips that curve to the side, permitting the muscles along the side of the pelvis to stabilize the body's center of gravity when one foot is on the ground; and humanlike feet with robust heels, a large big toe partly in line with the other toes, and a partial arch. The vertical posture necessary for bipedal locomotion places additional stress on our lower limb joints, making us more prone to osteoarthritis than our four-legged predecessors.

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Foot

The human foot, a marvel of evolution, showcases unique adaptations born from the demands of bipedal locomotion. Among these adaptations is the remarkable pedal arch, a defining feature distinguishing humans from their primate relatives. While other primates retain a grasping foot, humans have sacrificed this trait to embrace terrestrial bipedalism. The permanent alignment of the great toe with the rest of the digits underscores this evolutionary shift, enabling the foot to serve dual roles as a propulsive lever and an energy dissipater during locomotion. However, this adaptation comes at a cost. The absence of a grasping foot limits climbing abilities and exposes humans to various foot pathologies, including plantar fasciitis and heel spurs, stemming from the strain placed on the plantar aponeurosis. The importance of the pedal arch becomes strikingly evident when considering the debilitating conditions afflict those without it, such as fatigue fractures and bunions. Despite these costs, the pedal arch remains a testament to the enduring legacy of bipedalism in shaping the human form.[3]

Eyesight

One significant adaptation is the forward-facing orientation of the eyes, which enhances binocular vision to work effectively with our hands. This arrangement allows for overlapping fields of view from each eye, improving depth perception and accurately judging distances. However, this forward-facing orientation comes at the expense of panoramic vision, limiting the peripheral field of view compared to animals with lateral placement of eyes.

Hand

Even within the very apparatus of our manipulation, the hand, we encounter the toll of evolution. Osteoarthritis in critical hand joints, including the trapeziometacarpal and distal interphalangeal joints, serves as a poignant reminder of the sacrifices our bodies make in pursuing progress and innovation.

Numerous additional examples highlight the significant changes that have transpired in the evolutionary process to shape hands as they are today. Many of these changes have come at the expense of other bodily features, making them vulnerable. Nonetheless, the form and function of hands have been so critical that other body parts have adapted to accommodate these modifications. It is undeniable that, without the aid of hands and these essential body accessories, our world would lack the level of civilization, culture, and advancement it currently possesses.

Conclusion

As a hand surgeon, I am inspired by the idea that the intricate use of human hands has shaped the development of other body parts throughout evolution. Treating hand Treating hand conditions, and restoring an integrated bionic hand closely resemble a natural hand for amputees not only restores vital function and reduces suffering but also supports the broader adaptive mechanisms that evolution has put in place.[4] By providing innovative and empathetic care, hand surgeons contribute significantly to maintaining the hand's pivotal role in human expression and interaction, ensuring that individuals can continue to engage fully in life's activities and connections, which are core to the human experience.

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References

1. Ramazanian T, Fu S, Sohn S, Taunton MJ, Kremers HM. Prediction Models for Knee Osteoarthritis: Review of Current Models and Future Directions. Arch Bone Jt Surg. 2023;11(1):1-11. doi: 10.22038/ABJS.2022.58485.2897. PMID: 36793660; PMCID: PMC9903309.
2. Lieberman DE. Four legs good, two legs fortuitous: brains, brawn, and the evolution of human bipedalism. In: In the light of evolution: essays from the laboratory and field. Losos JB, ed. Greenwood Village, CO: Roberts and Co; 2011.
3. Latimer B. The perils of being bipedal. Ann Biomed Eng. 2005; 33(1):3-6. doi: 10.1007/s10439-005-8957-8.
4. Daliri M, Akbarzadeh A, Mohammadi M, Moradi A. A Proposal of a Design for the Bionic Hand: Describing the Integration, Motor Controlling System, Stereognosis, and Proprioception Sensory Feedback Components. Arch Bone Jt Surg. 2024;12(4):296-297. doi: 10.22038/ABJS.2023.76233.3541. PMID: 38716179; PMCID: PMC11070681.