MA Thesis – Human Skeletal Biology Track, Physical Anthropology - New York University (2010)

A COMPARATIVE STUDY OF THE ANATOMICAL MECHANICAL ADVANTAGE OF THE ANTHROPOID ELBOW

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Abstract

Mechanical advantage of the muscles controlling flexion and extension of the elbow joint has been a focus of many primate locomotion studies. These studies have tended to concentrate on either the *triceps brachii muscle* (TBM), an elbow extensor, or the *biceps brachii muscle* (BBM), an elbow flexor. The anatomical mechanical advantage (AMA) of these muscles, an approximation of their effective mechanical advantage, can be calculated from landmarks on the radius and ulna. Certain studies have found that elbow AMA can be used to distinguish between primate species with different locomotor repertoires, and thus can inform fossil primate behavioral reconstructions. However, recent studies have contested these findings on several grounds, including the overlap in AMA values between species with different locomotor repertoires, and the effects of body size scaling on elbow AMA. This study attempts to address this controversy in two ways: (i) by examining the *brachialis muscle* (BM), an elbow flexor that has received little attention in primate elbow AMA studies, and (ii) by comparing the AMAs of the TBM, BBM, and BM among a large sample of extant anthropoid species representing a broad range of different locomotor repertoires. The results of this study reveal that elbow AMA *can* be used to reliably distinguish primate species with suspensory components in their behavioral repertoires from primarily quadrupedal species, and that elbow AMA can be used to distinguish between species engaging in different types of suspensory behavior (e.g., fast brachiation versus slow climbing). Additionally, this study finds that the AMAs of the BM and BBM are closely correlated among primate species, and thus can be used in place of one another in elbow flexor mechanical advantage determinations. These findings indicate that elbow AMA calculations from complete ulnae and/or radii can aid in behavioral reconstructions of fossil primate species. However, the consistent overlap of AMA values in humans and African apes suggests that elbow AMA should *not* be used to determine the locomotor behavior of fossil hominins.