Introduction: We hypothesized that the humeral retroversion angle may be affected by participation in sports requiring repetitive overhead throwing, especially in athletes who have played in throwing sports since childhood. Then, we used CT to measure the HRA of young baseball players and compared the results with the HRA of adult athletes.

Materials and Methods: We studied 32 young baseball players (A group), ranging in age from 10 to 15 years (mean, 12.1 years). Years of play ranged from 2 to 9 years (mean, 5.4 years). We also studied 65 adult baseball players who had played baseball since childhood (B group). Of these, 37 were professional baseball players, 27 were recreational athletes, and one played baseball at the university level. The ages of the adult baseball players ranged from 20 to 36 years (mean, 26 years). Years of play ranged from 10 to 28 years (mean, 19.8 years). We also evaluated two control groups (C and D group) who had never played competitive overhead throwing sports. C group consisted of 10 young subjects, ranging in age from 8 to 14 (mean, 10.7 years). D group consisted of 11 adult subjects, ranging in age from 23 to 32 years (mean, 28 years). Each subject was placed in the supine position, and CT scans of both shoulders were obtained. The CT imaging was performed using a section thickness of 5 mm. HRA was measured using CT images between a slice through the center of the humeral head and a slice through the medial to the lateral epicondyle of the humerus. Before measuring HRA in the subjects, we obtained CT scans of the humerus in 3 male cadavers. We dissected the humeral heads and compared them with the CT images. The cartilaginous margin of the dissected humeral head corresponded with the cartilaginous margin on the CT scans. On each CT scan, we drew two lines (Figure 1).

Results: Results of our measurements are summarized in Figure 2.

Discussion: According to Edelson, the humeral head is in marked retroversion in utero and at birth, and thereafter derotates to assume the mature value. In a recent report, Crockett and associates reported that the mean HRA of 25 professional baseball pitchers was 40° for the throwing side and 23° for the non-throwing side. In another study the HRA of the throwing side was 36° and that of the non-throwing side was 26°. In our study, the HRA of the throwing side was significantly greater than that of the non-throwing side in both groups of baseball players. Furthermore, the mean HRA on the throwing side of young baseball players was significantly larger than that of adult baseball players, suggesting that the adaptive bony change of the humerus was caused by throwing stress and might occur in the early formative years of a player’s career. The throwing motion produces an excessive force and torque on the shoulder joint and elbow joint. According to Sabick, peak humeral axial torque reached a mean value of 92±16 Nm near the time of maximum shoulder external rotation at the end of the cocking phase. Some authors report that asymmetric bony changes are caused by dynamic stress in human subjects. Our results suggest that further investigation is needed into how HRA might be affected by the repetitive stress of the throwing motion; extrinsic demand, such as an excessive external rotation in the throwing motion and or an imbalance in muscle strength.

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