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Adaptive Changes of the Ulnar Collateral Ligament of Professional Baseball from Different Climates Over Multiple Seasons: An 18-Year Study

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INTRODUCTION

The ulnar collateral ligament (UCL) is put under high levels of stress through the overhead throwing motion typical of professional baseball pitchers.

In response to repetitive stress the UCL undergoes adaptive changes including thickening of the ligament and increased joint laxity under valgus stress.

Investigations such as this one offer insight into the changes in the UCL of professional pitchers over multiple years of professional play as well as the risk for injuries that may be associated with these changes

MATERIALS & METHODS

Dynamic stress ultrasounds (SUS) of professional baseball pitchers were taken over an 18 year period.

Player demographics were collected to determine climate of origin. SUS measurements of the same player taken 3 years apart were examined to determine changes in relative UCL thickness and laxity between the dominant and nondominant arms.

The term 'relative' refers to (dominant – non-dominant), laxity (joint space distance under stress - joint space distance at rest). SUS were also examined at time of measurements for pathologic findings.

FIGURES and TABLES

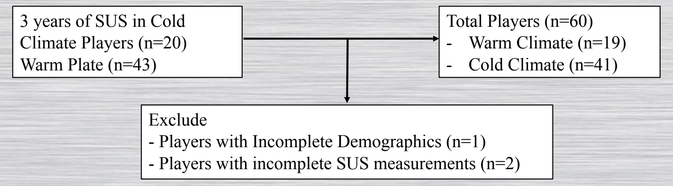

Figure 1: Inclusion/Exclusion Flow Diagram

	Total Data N=60	Cold N=19	Warm N=41	P Value
Age	19.0 [19.0;21.0]	20.0 [19.0;21.5]	19.0 [18.0;21.0]	.266
Dominant Elbow:				.73
Left	11 (18.3%)	4 (21.1%)	7 (17.1%)	
Right	49 (81.7%)	15 (78.9%)	34 (82.9%)	
Born in USA:				.089
No	27 (45.0%)	5 (26.3%)	22 (53.7%)	
Yes	33 (55.0%)	14 (73.7%)	19 (46.3%)	
Player Drafted:				**.004***
No	24 (40.0%)	2 (10.5%)	22 (53.7%)	
Yes	36 (60.0%)	17 (89.5%)	19 (46.3%)	

Table 1. Demographic information for all included pitchers, Bold indicates significance, SUS = Stress Ultrasound, Continuous variables presented as median [1st quartile;3rd quartile], categorical variables are present as n (%)

	Total Data (n=60)	Cold (n=19)	Warm (n=41)	P Value
Progression of Relative UCL Thickness (mm)	0.60 (1.68)	0.72 (2.03)	0.55 (1.51)	.748
Progression of Relative Laxity (mm)	0.02 (1.15)	-0.01 (1.04)	0.03 (1.21)	.904

Table 2. Comparison of dominant and nondominant arm stress ultrasound measurements over 3-year period. UCL = Ulnar Collateral Ligament, a positive value indicates that the dominant arm UCL saw a relative increase in thickness during the study period compared to the non-dominant arm. For laxity, a positive result indicates a relative increase in dominant arm laxity over time. Mean (SD)

RESULTS

Players from colder and warmer climates did not differ from one another in the progression of relative UCL thickness (0.72 mm vs 0.55 mm, P = .748) of relative laxity (-0.01 mm vs 0.03 mm, P = .904).

Both groups did not differ in rates of pathology development including calcifications (P = .412), hypoechoic foci (P = .084), osteophyte (P = .892).

DISCUSSION

Adaptive changes of the UCL in professional baseball pitchers originating from colder and warmer climates did not significantly differ from one another. Although there is potential for those from warmer climates to throw year-round the effect may not be enough to cause noticeable changes over a 3 year period. Future studies should expand on this investigation with examination of injuries of players from different climates to determine if any correlation exists with UCL changes in an expanded cohort.

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