Systemic Hormonal Contraceptive Use is Associated with Greater Odds of Shoulder Pathologies: A Propensity Matched Epidemiological Study

Argen Omurzakov BA[1], Arsen M. Omurzakov BA[2], Robert J. Burkhart MD[3], Aakash K. Shah BA[1], James E. Voos MD[3], Jacob G. Calcei MD[3], John M. Apostolakos MD MPH[3]

[1]Case Western Reserve University School of Medicine, Cleveland, OH, [2]Weill Cornell Medical College, New York, NY, [3]UH Drusinsky Sports Medicine Institute, Cleveland, OH

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INTRODUCTION: Up to half of female athletes take hormonal contraceptives (HCs), but their impact on musculoskeletal health and injury rates remains understudied. This study sought to investigate whether different HC formulations affect the 5-year incidences of various soft-tissue shoulder injuries in female patients.

METHODS: A retrospective cohort study of females aged 13–50 with at least 5 years of follow-up was conducted using the TriNetX Network. Patients prescribed systemic estrogen-only (n = 95,109), progestin-only (n = 766,264), or combined HCs (n = 625,809) were matched 1:1 to controls using propensity score matching. Odds ratios (ORs), 95% confidence intervals (CIs), and Bonferroni-adjusted P-values (significance set at $P < 0.005$) were calculated at 5 years post-index for ten shoulder soft tissue pathologies.

RESULTS SECTION: Estrogen-only HC users had significantly increased odds of rotator cuff tears (RCT; OR: 1.8, $P < 0.001$), capsule sprains (CS; OR: 2.0, $P < 0.001$), shoulder instability (SI; OR: 1.5, $P = 0.006$), dislocation or subluxation (DS; OR: 1.5, $P = 0.014$), superior labral tears (SLT; OR: 2.1, $P < 0.001$), bursitis (B; OR: 2.2, $P < 0.001$), calcific tendinitis (CT; OR: 2.4, $P < 0.001$), impingement (IMP; OR: 2.2, $P < 0.001$), and acromioclavicular (AC) joint sprain (AC-S; OR: 2.1, $P = 0.019$), with no significant difference for AC joint dislocation (AC-D; OR: 1.4, $P = 0.258$). Similarly, progestin HC users had significantly increased odds of RCT (OR: 1.5, $P < 0.001$), CS (OR: 1.6, $P < 0.001$), SI (OR: 1.7, $P < 0.001$), DS (OR: 1.6, $P < 0.001$), SLT (OR: 1.5, $P < 0.001$), B (OR: 1.6, $P < 0.001$), CT (OR: 1.8, $P < 0.001$), IMP (OR: 1.8, $P < 0.001$), AC-S (OR: 1.7, $P < 0.001$), and AC-D (OR: 1.6, $P < 0.001$). Combined HC users also showed significantly increased odds for all outcomes: RCT (OR: 1.6, $P < 0.001$), CS (OR: 1.9, $P < 0.001$), SI (OR: 1.7, $P < 0.001$), DS (OR: 1.5, $P < 0.001$), SLT (OR: 1.7, $P < 0.001$), B (OR: 1.8, $P < 0.001$), CT (OR: 1.9, $P < 0.001$), IMP (OR: 2.1, $P < 0.001$), AC-S (OR: 1.9, $P < 0.001$), and AC-D (OR: 1.5, $P < 0.001$).

DISCUSSION: This study found that all systemic HC formulations were associated with increased odds of all ten examined shoulder soft tissue pathologies.

SIGNIFICANCE/CLINICAL RELEVANCE: Given that up to half of female athletes use hormonal contraceptives, these findings highlight a potential underrecognized risk factor for shoulder soft tissue pathology. Awareness of the association between systemic hormonal contraceptive use and higher odds of rotator cuff, labral, and instability-related injuries may inform counseling, injury prevention strategies, and future research on sex-specific musculoskeletal health.

Characteristic	Therapy Class		
	Estrogen Only Therapy		
	Estrogen (n = 95,109)	**Control (n = 95,109)**	**SMD**
Age, years (range)	27 ± 10.3	27 ± 10.3	<0.001
White	63,165	63,165	<0.001
African American	11,145	11,147	<0.001
Hispanic or Latino	8,767	12,422	0.122
Obesity	6,753	6,752	<0.001
Diabetes Mellitus	1,864	1,863	<0.001
Hypertensive Diseases	3,943	3,945	<0.001
	Progestin Only Therapy		
	Progestin (n = 766,264)	**Control (n = 766,264)**	**SMD**
Age, years (range)	27.1 ± 7.47	27.2 ± 7.67	0.019
White	430,160	432,241	0.006
African American	176,166	177,047	0.003
Hispanic or Latino	119,610	88,077	0.120
Obesity	60,201	54,855	0.027
Diabetes Mellitus	14,025	17,163	0.029
Hypertensive Diseases	32,605	36,966	0.027
	Combined Therapy		
	Combined Therapy (n = 625,809)	**Control (n = 625,809)**	**SMD**
Age, years (range)	25 ± 7.0	25 ± 7.1	0.010
White	400,634	402,165	0.005
African American	109,479	108,760	0.003
Hispanic or Latino	74,267	75,800	0.008
Obesity	45,172	43,959	0.008
Diabetes Mellitus	13,401	14,119	0.008
Hypertensive Diseases	17,248	18,178	0.009

Table 1: Patient Demographics

Outcome	Therapy Class			
	Estrogen Only Therapy			
	Estrogen (n = 95,109)	**Control (n = 95,109)**	**Odds Ratio**	**P Value**
Rotator Cuff Tear	374	211	1.8, (1.5, 2.0)	**<0.001**
Shoulder Instability	126	86	1.5, (1.1, 1.9)	0.006
Sprain of Rotator Cuff Capsule	69	35	2.0, (1.3, 3.0)	**<0.001**
Dislocations/Subluxations	100	68	1.5, (1.1, 2.0)	0.014
Bursitis	332	148	2.2, (1.8, 2.7)	**<0.001**
Superior Glenoid Labrum Tear	193	92	2.1, (1.6, 2.7)	**< 0.001**
Impingement	408	183	2.2, (1.9, 2.7)	**<0.001**
Calcific Tendinitis	130	54	2.4, (1.7, 3.3)	**<0.001**
AC Joint Sprain	28	13	2.1, (1.1, 4.2)	0.019
AC Joint Dislocation	29	21	1.4, (0.8, 2.4)	0.258
	Progestin Only Therapy			
	Progestin (n = 766,264)	**Control (n = 766,264)**	**Odds Ratio**	**P Value**
Rotator Cuff Tear	2,651	1,358	1.5, (1.4, 1.6)	**<0.001**
Shoulder Instability	1,043	625	1.7, (1.5, 1.8)	**< 0.001**
Sprain of Rotator Cuff Capsule	478	298	1.6, (1.4, 1.9)	**<0.001**
Dislocations/Subluxations	821	530	1.6, (1.4, 1.7)	**<0.001**
Bursitis	1,864	1,182	1.6, (1.5, 1.7)	**<0.001**
Superior Glenoid Labrum Tear	951	649	1.5, (1.3, 1.6)	**<0.001**
Impingement	2,316	1,306	1.8, (1.7, 1.9)	**<0.001**
Calcific Tendinitis	779	451	1.8, (1.6, 2.0)	**< 0.001**
AC Joint Sprain	228	135	1.7, (1.4, 2.1)	**< 0.001**
AC Joint Dislocation	303	188	1.6, (1.3, 1.9)	**< 0.001**
	Combined Therapy			
	Combined Therapy (n = 625,809)	**Control (n = 625,809)**	**Odds Ratio**	**P Value**
Rotator Cuff Tear	1,387	892	1.6, (1.4, 1.7)	**< 0.001**
Shoulder Instability	1,011	605	1.7, (1.5, 1.9)	**< 0.001**
Sprain of Rotator Cuff Capsule	420	222	1.9, (1.6, 2.2)	**< 0.001**
Dislocations/Subluxations	697	471	1.5, (1.3, 1.7)	**< 0.001**
Bursitis	1,440	813	1.8, (1.6, 1.9)	**< 0.001**
Superior Glenoid Labrum Tear	849	496	1.7, (1.5, 1.9)	**< 0.001**
Impingement	1,704	828	2.1, (1.9, 2.2)	**< 0.001**
Calcific Tendinitis	502	264	1.9, (1.6, 2.2)	**< 0.001**
AC Joint Sprain	225	116	1.9, (1.6, 2.4)	**< 0.001**
AC Joint Dislocation	239	161	1.5, (1.2, 1.8)	**< 0.001**

Table 2: Incidences of Shoulder Injuries