

Oral Contraceptive Use Has Protective Effect Against Rotator Cuff Tears in Women

Rachel X. Shi¹, Om B. Jahagirdar¹, Jonathan N. Grauer¹

¹Yale School of Medicine, New Haven, CT

rachel.shi@yale.edu

Disclosures: Rachel X. Shi (N), Om B. Jahagirdar (N), Jonathan N. Grauer (North American Spine Society Journal Editor-in-Chief, Journal of American Academy of Orthopedic Surgeons Deputy Editor, North American Spine Society past board member)

INTRODUCTION:

Rotator cuff tears (RCTs) are a leading cause of shoulder pain and dysfunction in adults and occur with increased prevalence in women. Hormonal fluctuations related to the menstrual cycle may contribute to this sex difference, as estrogen and progesterone regulate type I collagen synthesis, and notably menopausal decline in estrogen has been linked to reduced tendon collagen content. Moreover, an immunohistochemical study found increased estrogen receptors associated with tendon alterations in the supraspinatus tendon of RCT patients.

Oral contraceptives (OCPs) modulate hormone levels, with initial findings demonstrating a potential protective effect against musculotendinous injuries such as anterior cruciate ligament injuries, but evidence regarding the impact of OCP use on RCTs is limited. The current study investigated the potential association between OCP use and RCTs using a large, national, administrative database, aiming to inform preventive strategies in young women.

METHODS:

A retrospective database study was conducted using the M170Ortho PearlDiver Mariner Patient Claims Database, which contains information on demographics, drug prescriptions, medical diagnoses, and procedures. Our Institutional Review Board deemed this study exempt from review as all data in the database are de-identified and aggregated. The database was queried for patients with RCTs using International Classification of Diseases (ICD) codes. A non-RCT control cohort was established using a PearlDiver control dataset, including patients without orthopaedic conditions that are not represented in the M170Ortho database.

Inclusion criteria were female patients aged 15 to 50 years old to limit the populations to those of menstruating age. Exclusion criteria were diagnoses of amenorrhea, oligomenorrhea, polycystic ovary syndrome, and usage of non-OCP sex hormone medications to eliminate confounders that influence endogenous levels of hormones during the menstrual cycle. The RCT and non-RCT cohorts were matched 1:1 based on age, Elixhauser Comorbidity Index (ECI), and presence of severe obesity (BMI ≥ 40 for adults and $\geq 95^{\text{th}}$ percentile for pediatrics). After matching, both cohorts consisted of 54,323 patients.

The two cohorts were stratified based on history of OCP prescription records. Patients with an OCP record within the year prior to injury were defined as being “on OCPs”. Within the OCP groups, patients were stratified based on OCP type (i.e. estrogen-progesterone, non-estrogen) for secondary analysis. Age, ECI, and severe obesity were compared between the RCT and non-RCT cohorts pre- and post-matching. OCP usage between the matched RCT and non-RCT cohorts were compared. Continuous variables were compared using Student’s t-tests and categorical variables were compared using Pearson chi-squared tests. Multivariate logistic regression was used to determine independent predictors of RCT.

RESULTS SECTION:

A total of 193,785 patients met inclusion criteria for the RCT cohort and 108,784 patients for the non-RCT cohort. The RCT cohort was older (42.3 vs. 27.5 years, $p < 0.001$), had a higher ECI (3.0 vs. 1.0, $p < 0.001$), and had a higher proportion of patients with severe obesity (9.3% vs. 2.2%, $p < 0.001$). Matching eliminated these differences.

Univariate analysis showed that patients in the RCT cohort were less likely to be on OCPs compared to non-RCT patients (15.4% vs. 20.1%, $p < 0.001$). The univariate odds ratio (OR) for RCT between OCP and non-OCP users was 0.72 ($p < 0.001$). Upon analysis by OCP type relative to non-OCP users, the univariate ORs for estrogen-progesterone OCP users and non-estrogen OCP users was 0.73 ($p < 0.001$) and 0.27 ($p < 0.001$), respectively.

Multivariate analysis showed that OCP use was significantly associated with decreased odds of RCT (OR 0.69, 95% confidence interval [CI] 0.67-0.72, $p < 0.001$). Multivariate ORs of RCTs for estrogen-progesterone OCP and non-estrogen OCP use were 0.71 (CI 0.68-0.73, $p < 0.001$) and 0.27 (CI 0.23-0.30, $p < 0.001$), respectively.

DISCUSSION:

Hormonal fluctuations have been implicated in predisposing menstruating women to musculotendinous injury. This association has been previously explored for anterior cruciate ligament tears and other lower extremity tendinous injuries, in which OCPs were found to have a protective effect. Although preliminary studies have identified the presence of sex hormone receptors on rotator cuff tendons, there has been a need for studies on the correlation of OCPs on RCTs.

In the current study, OCP use was found to be associated with decreased odds of RCT, in agreement with prior literature on the protective effect of OCPs against musculotendinous injuries. Analysis by OCP formulation revealed a stronger protective effect for non-estrogen OCPs relative to estrogen-progesterone OCPs.

Due to the nature of retrospective administrative database studies, this study is limited by several factors. It relies on the accuracy of the administrative coding, causality cannot be determined, and factors such as patient occupation or sport cannot be assessed.

SIGNIFICANCE/CLINICAL RELEVANCE:

To the authors’ knowledge, this is the first study to assess the correlation of OCPs on RCT. These findings may help guide prevention and management guidelines for women, especially those who are athletes that are susceptible to overuse injury.