

Anabolic Steroids, Testosterone and Tendon Rupture Risk

Overview

- Testosterone replacement therapy is associated with increased odds of surgically treated tendon rupture [1].
- Testosterone users had a 2.9-fold increased risk of tendon rupture compared to nonusers [2].
- It is premature to imply causation between testosterone replacement therapy and anterior cruciate ligament injuries based solely on existing results due to confounding variables [3].
- Clinicians should remain vigilant and prescribe testosterone replacement therapy judiciously with a thorough assessment of each patient's unique risk profile regarding anterior cruciate ligament injury risk [3].
- There is a threshold-dependent relationship between testosterone levels and shoulder pathology [4].
- Hormonal status should be considered in musculoskeletal risk assessment [4].
- The use of prescription testosterone is associated with an increased likelihood of experiencing a distal biceps tendon injury [5].
- The use of prescription testosterone is associated with an increased likelihood of subsequently requiring surgical repair for distal biceps tendon injury [5].
- Patients with prior prescription testosterone exposure have an increased rate of distal biceps tendon injury compared with patients without such exposure [5].
- Patients with prior prescription testosterone exposure have an increased rate of biceps tendon repair compared with patients without such exposure [5].
- Surgeons should be more intentional about discussing endocrinologic history with patients regarding quadriceps tendon injury risk [6].
- Surgeons should counsel patients with testosterone deficiency on the risks for injury or re-injury [6].
- Patients who filled a prescription for testosterone replacement therapy were much more likely to experience a quadriceps muscle or tendon injury within 1 year of filling their prescription [7].
- Patients who filled a prescription for testosterone replacement therapy were at increased risk of undergoing surgical repair of the quadriceps tendon [7].
- Testosterone replacement therapy is associated with increased tendon rupture risk in men [8].
- Testosterone replacement therapy is not associated with increased tendon rupture risk in women [8].

- The association between testosterone replacement therapy and increased tendon rupture risk may be due to sex-specific differences in dosing [8].
- Anabolic steroid use may contribute to pectoralis major rupture [9].
- Continuation of anabolic steroids during recovery from pectoralis major rupture does not seem to have a negative effect on functional recovery [9].
- Selective androgen receptor modulator (SARM) use is associated with tendon damage [10].
- Prescription testosterone is associated with a higher risk of infection-related reoperations after primary total shoulder arthroplasty in male patients [13].
- Prescription testosterone is associated with a higher risk of all-cause reoperations after primary total shoulder arthroplasty in male patients [13].

Background & Causes

- Testosterone replacement therapy is associated with increased odds of surgically treated tendon rupture [1].
- Testosterone users had a 2.9-fold increased risk of tendon rupture compared to nonusers [2].
- It is premature to imply causation between testosterone replacement therapy and anterior cruciate ligament injuries based solely on existing results due to confounding variables [3].
- There is a threshold-dependent relationship between testosterone levels and shoulder pathology [4].
- Prescription testosterone use is associated with an increased likelihood of experiencing a distal biceps tendon injury [5].
- Patients with prior prescription testosterone exposure have an increased rate of biceps tendon repair compared with patients without such exposure [5].
- Testosterone therapy is associated with increased odds of quadriceps tendon injury [6].
- Patients who filled a prescription for testosterone replacement therapy were much more likely to experience a quadriceps muscle or tendon injury within 1 year of filling their prescription [7].
- Patients who filled a prescription for testosterone replacement therapy were at increased risk of undergoing surgical repair of the quadriceps tendon [7].
- Testosterone replacement therapy is associated with increased tendon rupture risk in men but not women [8].
- The association between testosterone replacement therapy and increased tendon rupture risk in men but not women may be due to sex-specific differences in dosing [8].
- Anabolic steroid use may contribute to pectoralis major rupture [9].
- Continuation of anabolic steroids during recovery from pectoralis major rupture does not seem to have a negative effect on functional recovery [9].
- Selective androgen receptor modulator (SARM) use is associated with tendon damage [10].
- Testosterone replacement therapy within 1 year of rotator cuff repair appears to be a risk factor for multiple postoperative complications [11].

- Testosterone replacement therapy within 1 year of rotator cuff repair appears to be a risk factor for subsequent shoulder surgery [11].
- Further research is needed to understand the mechanism by which testosterone increases the risk of reoperation after total shoulder arthroplasty [12].
- Prescription testosterone is associated with an increased risk of infection-related reoperations after primary total shoulder arthroplasty in male patients [13].
- Prescription testosterone is associated with an increased risk of all-cause reoperations after primary total shoulder arthroplasty in male patients [13].
- Bioavailable testosterone levels are a risk factor for osteoarthritis [17].
- There is a causal relationship between bioavailable testosterone levels and osteoarthritis [17].
- Low testosterone levels are independently associated with an increased risk of osteoarthritis in the U.S. population [18].

Symptoms & Presentation

- Testosterone replacement therapy is associated with increased odds of surgically treated tendon rupture [1].
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- Testosterone replacement therapy within 1 year of rotator cuff repair appears to be a risk factor for subsequent shoulder surgery [11].

- Supplemental testosterone increases the risk of reoperation after total shoulder arthroplasty [12].
- Prescription testosterone is associated with an increased risk of infection-related reoperations after primary total shoulder arthroplasty in male patients [13].
- Prescription testosterone is associated with an increased risk of all-cause reoperations after primary total shoulder arthroplasty in male patients [13].
- Testosterone therapy is associated with rotator cuff tears, repairs, and revision repairs [15].
- Testosterone deficiency is associated with poorer postoperative outcomes in total joint arthroplasty [16].

Management

- Testosterone replacement therapy is associated with increased odds of surgically treated tendon rupture [1].
- Testosterone users had a 2.9-fold increased risk of tendon rupture compared to nonusers [2].
- It is premature to imply causation between testosterone replacement therapy and ACL injuries based solely on existing results due to confounding variables [3].
- Clinicians should remain vigilant and prescribe TRT judiciously with a thorough assessment of each patient's unique risk profile [3].
- Findings suggest a threshold-dependent relationship between testosterone and shoulder pathology [4].
- Hormonal status should be considered in musculoskeletal risk assessment [4].
- The use of prescription testosterone is associated with an increased likelihood of experiencing a distal biceps tendon injury [5].
- The use of prescription testosterone is associated with an increased likelihood of subsequently requiring surgical repair for distal biceps tendon injury [5].
- Patients with prior prescription testosterone exposure have an increased rate of distal biceps tendon injury compared with patients without such exposure [5].
- Patients with prior prescription testosterone exposure have an increased rate of biceps tendon repair compared with patients without such exposure [5].
- Surgeons should be more intentional about discussing endocrinologic history with patients [6].
- Surgeons should counsel patients with testosterone deficiency on the risks for injury or re-injury [6].
- Patients who filled a prescription for testosterone replacement therapy were much more likely to experience a quadriceps muscle or tendon injury within 1 year of filling their prescription [7].
- Patients who filled a prescription for testosterone replacement therapy were at increased risk of undergoing surgical repair of the quadriceps tendon [7].
- TRT is associated with increased tendon rupture risk in men [8].
- TRT is not associated with increased tendon rupture risk in women [8].
- The association between TRT and tendon rupture risk in men but not women may be due to sex-specific differences in dosing [8].

- Anabolic steroids use may contribute to pectoralis major rupture injury [9].
- Continuation of anabolic steroids during recovery from pectoralis major rupture does not seem to have a negative effect on functional recovery [9].
- SARM use is associated with tendon damage [10].
- TRT within 1 year of rotator cuff repair appears to be a risk factor for multiple postoperative complications [11].
- TRT within 1 year of rotator cuff repair appears to be a risk factor for subsequent shoulder surgery [11].
- Further research is needed to understand the mechanism by which testosterone increases the risk of reoperation after total shoulder arthroplasty [12].
- Testosterone use is associated with a higher risk of infection-related reoperations after total shoulder arthroplasty in male patients [13].
- Testosterone use is associated with a higher risk of all-cause reoperations after total shoulder arthroplasty in male patients [13].
- Patients prescribed at least 3 months of TRT had a significantly higher incidence of ACL injuries compared to controls within a 2-year follow-up period [14].

Key Considerations

- Testosterone replacement therapy is associated with increased odds of surgically treated tendon rupture [1].
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- The use of prescription testosterone is associated with an increased likelihood of subsequently requiring surgical repair for distal biceps tendon injury [5].
- Patients with prior prescription testosterone exposure have an increased rate of distal biceps tendon injury compared with patients without such exposure [5].
- Patients with prior prescription testosterone exposure have an increased rate of biceps tendon repair compared with patients without such exposure [5].
- Surgeons should be more intentional about discussing endocrinologic history with patients [6].
- Surgeons should counsel patients with testosterone deficiency on the risks for injury or re-injury [6].

- Patients who filled a prescription for testosterone replacement therapy were much more likely to experience a quadriceps muscle or tendon injury within 1 year of filling their prescription [7].
- Patients who filled a prescription for testosterone replacement therapy were at increased risk of undergoing surgical repair of the quadriceps tendon [7].
- Testosterone replacement therapy is associated with increased tendon rupture risk in men [8].
- Testosterone replacement therapy is not associated with increased tendon rupture risk in women [8].
- The association between testosterone replacement therapy and increased tendon rupture risk in men but not women may be due to sex-specific differences in dosing [8].
- Anabolic steroid use may contribute to pectoralis major rupture in body builders [9].
- Continuation of anabolic steroids during recovery from pectoralis major rupture does not seem to have a negative effect on functional recovery [9].
- Testosterone replacement therapy within 1 year of rotator cuff repair appears to be a risk factor for multiple postoperative complications [11].
- Testosterone replacement therapy within 1 year of rotator cuff repair appears to be a risk factor for subsequent shoulder surgery [11].
- Further research is needed to understand the mechanism by which testosterone increases the risk of reoperation after total shoulder arthroplasty [12].

Key Evidence

- [L3] Testosterone replacement therapy is associated with increased odds of surgically treated tendon rupture. [1] ([10.1177/2325967125s00009](#))
- [L3] Testosterone users had a 2.9-fold increased risk of tendon rupture compared to nonusers. [2] ([10.1177/2325967124s00339](#))
- [L5] It is premature to imply causation between testosterone replacement therapy and ACL injuries based solely on existing results due to confounding variables; clinicians should remain vigilant and prescribe TRT judiciously with a thorough assessment of each patient's unique risk profile. [3] ([10.1016/j.arthro.2024.11.086](#))
- [L3] These findings suggest a threshold-dependent relationship between testosterone and shoulder pathology and highlight the need to consider hormonal status in musculoskeletal risk assessment. [4] ([10.1016/j.jse.2026.01.012](#))
- [L3] Patients with prior prescription testosterone exposure have an increased rate of distal biceps tendon injury and biceps tendon repair compared with patients without such exposure. [5] ([10.1016/j.jse.2023.02.122](#))
- [L5] The author advises surgeons to be more intentional about discussing endocrinologic history with patients and counseling those with testosterone deficiency on the risks for injury or re-injury. [6] ([10.1097/corr.0000000000002835](#))

- [L3] Patients who filled a prescription for testosterone replacement therapy were much more likely to experience a quadriceps muscle or tendon injury within 1 year of filling their prescription and were at increased risk of undergoing surgical repair of the quadriceps tendon. [7] ([10.1097/corr.0000000000002744](#))
- [L3] TRT is associated with increased tendon rupture risk in men but not women, potentially due to sex-specific differences in dosing. [8] ([10.1177/23259671261430731](#))
- [L4] Anabolic steroids use may contribute to the injury, but continuation during recovery does not seem to have a negative effect on functional recovery. [9] ([10.1186/s12891-023-06382-1](#))
- [L4] SARM use is associated with increased muscle mass, hepatotoxicity, cardiotoxicity, tendon damage, and androgenic side effects throughout the body. [10] ([10.1177/03635465241252435](#))
- [L3] TRT within 1 year of rotator cuff repair appears to be a risk factor for multiple postoperative complications and subsequent shoulder surgery. [11] ([10.1016/j.jseint.2025.10.002](#))
- [L3] Further research is needed to understand the mechanism by how testosterone increases the risk of reoperation after TSA. [12] ([10.1177/2325967124s00118](#))
- [L2] Testosterone use is associated with a higher risk of both infection-related and all-cause reoperations after total shoulder arthroplasty. [13] ([10.1016/j.jseint.2026.10.1634](#))
- [L3] This study found that patients prescribed at least 3 months of TRT had a significantly higher incidence of ACL injuries compared to controls within a 2-year follow-up period. [14] ([10.1016/j.arthro.2024.10.032](#))
- [L3] This finding may represent a musculoskeletal consequence of TRT and is important for patients and clinicians to understand. [15] ([10.5435/jaaos-d-22-00554](#))
- [L3] Testosterone deficiency is associated with poorer postoperative outcomes in total joint arthroplasty, with distinct patterns observed in THA and TKA. [16] ([10.5435/jaaos-d-25-00190](#))
- [L1] The results of our study supported a causal relationship between bioavailable testosterone levels and OA, identifying bioavailable testosterone levels as a risk factor for OA. [17] ([10.1186/s12891-025-08626-8](#))
- [L3] Low testosterone levels are independently associated with an increased risk of OA in the U.S. population. [18] ([10.1186/s12891-024-08272-6](#))

References

- [1] Testosterone Replacement Therapy Increases Odds of Tendon Ruptures Treated Surgically. *Orthopaedic Journal of Sports Medicine*. 2025. DOI: 10.1177/2325967125s00009 [2] Poster 374: Tendon Tears Among Patients Treated with Exogenous Therapeutic Anabolic Steroids: An Eight Year Retrospective Analysis in a Single Institution. *Orthopaedic Journal of Sports Medicine*. 2024. DOI: 10.1177/2325967124s00339 [3] Editorial Commentary: Testosterone Replacement Therapy and Anterior Cruciate Ligament Injury Risk: Insights and Cautions for Clinical Application. *Arthroscopy*. 2024. DOI: 10.1016/j.arthro.2024.11.086 [4] Testosterone levels and risk of adhesive capsulitis: a 1:1 propensity matched analysis. *Journal of Shoulder and Elbow Surgery*. 2026. DOI: 10.1016/j.jse.2026.01.012 [5] The use of prescription testosterone is associated with an increased

likelihood of experiencing a distal biceps tendon injury and subsequently requiring surgical repair. *Journal of Shoulder and Elbow Surgery*. 2023. DOI: 10.1016/j.jse.2023.02.122 [6] CORR Insights®: Testosterone Therapy Is Associated With Increased Odds of Quadriceps Tendon Injury. *Clinical Orthopaedics & Related Research*. 2023. DOI: 10.1097/corr.0000000000002835 [7] Testosterone Therapy Is Associated With Increased Odds of Quadriceps Tendon Injury. *Clinical Orthopaedics & Related Research*. 2023. DOI: 10.1097/corr.0000000000002744 [8] Testosterone Therapy and Associated Rates of Tendon Tear and Surgical Repair: A Retrospective Analysis. *Orthopaedic Journal of Sports Medicine*. 2026. DOI: 10.1177/23259671261430731 [9] Pectoralis major rupture in body builders: a case series including anabolic steroid use. *BMC Musculoskeletal Disorders*. 2023. DOI: 10.1186/s12891-023-06382-1 [10] Athlete Selective Androgen Receptor Modulators Abuse: A Systematic Review. *The American Journal of Sports Medicine*. 2025. DOI: 10.1177/03635465241252435 [11] Preoperative testosterone replacement therapy: a potential risk-factor for complications and reoperation after rotator cuff repair. *JSES International*. 2026. DOI: 10.1016/j.jseint.2025.10.002 [12] Poster 149: Supplemental Testosterone Increases Risk of Reoperation after Total Shoulder Arthroplasty. *Orthopaedic Journal of Sports Medicine*. 2024. DOI: 10.1177/2325967124s00118 [13] Prescription testosterone is associated with increased risk of infection-related and all-cause reoperations after primary total shoulder arthroplasty in male patients. *JSES International*. 2026. DOI: 10.1016/j.jseint.2026.101634 [14] Prescription Testosterone Is Associated With an Increased Risk of Anterior Cruciate Ligament Injury. *Arthroscopy*. 2024. DOI: 10.1016/j.arthro.2024.10.032 [15] The Relationship Between Testosterone Therapy and Rotator Cuff Tears, Repairs, and Revision Repairs. *Journal of the American Academy of Orthopaedic Surgeons*. 2023. DOI: 10.5435/jaaos-d-22-00554 [16] Testosterone Deficiency and Total Joint Arthroplasty Outcomes—A Large Claims Database Study. *Journal of the American Academy of Orthopaedic Surgeons*. 2025. DOI: 10.5435/jaaos-d-25-00190 [17] The causal impact of bioavailable testosterone levels on osteoarthritis: a bidirectional Mendelian randomized study. *BMC Musculoskeletal Disorders*. 2025. DOI: 10.1186/s12891-025-08626-8 [18] Correlation between low testosterone levels and the risk of osteoarthritis: a cross-sectional analysis of NHANES data (2011–2016). *BMC Musculoskeletal Disorders*. 2025. DOI: 10.1186/s12891-024-08272-6