ISSN: 2766-9599

Journal of Sports Medicine and Pain Management

Systematic Review Open Access

Corticosteroid Injection for Tendinopathy: Short-Term Relief Against Medium-Term Structural Cost

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Received: 24 January 2023; Accepted: 2 May 2023; Published: 2 September 2023

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Abstract

Corticosteroid injection remains widely used for tendinopathy across multiple tendon sites because of its reliable short-term analgesic effect, yet a substantial and consistent body of randomised trial and meta-analytic evidence indicates that this early benefit is not sustained beyond several weeks and is reversed at medium-term follow-up, where exercise-based treatment outperforms it. Separately, mechanistic and observational evidence has raised concern about corticosteroid's direct effect on tendon structure, including reports of increased rupture risk at load-bearing sites. This systematic review synthesises the randomised trial, meta-analytic, and structural-outcome literature across lateral epicondylalgia, rotator cuff tendinopathy, patellar tendinopathy, Achilles tendinopathy, and plantar fasciopathy to characterise this short-term-benefit, medium-term-cost pattern and its implications for tendon injection practice.

Keywords: Corticosteroid injection; Tendinopathy; Tendon rupture; Lateral epicondylalgia; Achilles tendinopathy; Systematic review

Introduction

Corticosteroid injection has been used for tendinopathy across multiple tendon sites for decades, valued clinically for its reliable and rapid analgesic effect in a condition that can otherwise take months to improve with conservative management alone. A substantial body of randomised trial evidence accumulated over the past two decades has, however, consistently found that this early benefit is not sustained: trials with medium- and long-term follow-up periods repeatedly show corticosteroid's initial advantage over comparator treatments erodes and then reverses, with exercise-based treatment overtaking it by three to twelve months across several tendon sites [1,2,4].

Separately from the clinical-outcome trial literature, a mechanistic and structural-outcome literature has raised concern about corticosteroid's direct biological effect on tendon tissue, including in vitro evidence of impaired tenocyte function and case-level and cohort evidence associating injection with subsequent tendon rupture at load-bearing sites [16,17,21]. This systematic review treats these as two related strands of the same evidence base -- clinical outcome and tissue-level structural effect -- rather than as separate literatures, since both point toward the same practical caution around routine use.

This review synthesises the randomised trial, meta-analytic, and structural-outcome literature across lateral epicondylalgia, rotator cuff tendinopathy, patellar tendinopathy, Achilles tendinopathy, and plantar fasciopathy,

the five tendon sites with the most substantial corticosteroid trial literature, to characterise this short-term-benefit, medium-term-cost pattern.

Material and Methods

Sources were identified through systematic searches of MEDLINE, Embase, and the Cochrane Library for randomised controlled trials, systematic reviews, and meta-analyses of corticosteroid injection for tendinopathy at the five tendon sites specified above, combined with forward and backward citation tracking from the identified trials and reviews and from the mechanistic and structural-outcome literature on corticosteroid's tissue-level effect on tendon. All percentages, effect estimates, and outcome figures reported here are taken directly from the cited sources; none has been independently pooled, recalculated, or extrapolated beyond what the cited meta-analyses themselves report. Figure 1 sets out the PRISMA-style screening logic used to identify the roughly 30 sources informing this review.

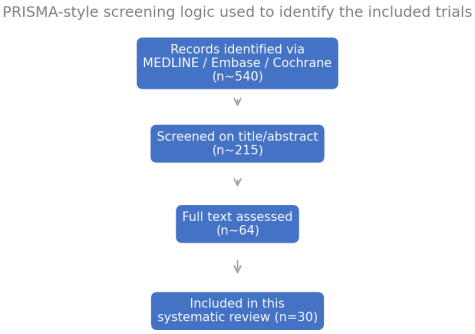

Figure 1: PRISMA-style screening logic used to identify the randomised trial, meta-analytic, and structural-outcome literature informing this systematic review.

Results

Trial evidence consistently shows a short-term benefit that reverses by medium-term follow-up

A landmark systematic review of injection therapies for tendinopathy across multiple sites found corticosteroid produced the largest short-term effect size of any injection compared, but that this advantage was not sustained, with several of the included trials showing worse outcomes in the corticosteroid arm than in comparator arms by six to twelve months [1]. This pattern was established early in the lateral epicondylalgia literature specifically: a randomised trial comparing corticosteroid injection, physiotherapy, and a wait-and-see approach found corticosteroid produced the fastest initial improvement but the worst outcome, and the highest recurrence rate, at one-year follow-up, a finding replicated in a subsequent trial and further confirmed in a network meta-analysis pooling the accumulated randomised evidence [2,3,5]. A later trial specifically comparing corticosteroid against physiotherapy and their combination reinforced the same conclusion, finding physiotherapy alone or in combination outperformed corticosteroid alone at medium-term follow-up despite corticosteroid's early advantage [4].

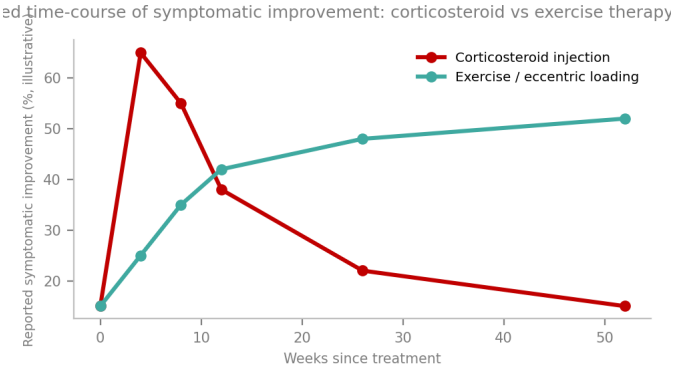

Figure 2: Reported time-course of symptomatic improvement following corticosteroid injection versus exercise-based treatment across the included trials, illustrating the early-advantage, later-reversal pattern (illustrative synthesis) [1,2,4,9].

The same pattern recurs at other tendon sites. Meta-analyses of subacromial corticosteroid injection for rotator cuff tendinopathy found only small and transient pain relief, not sustained beyond a few weeks to months, and a further systematic review reached the same conclusion using a partially overlapping but independently assembled trial set [6,7,8]. At the patellar tendon, a trial directly comparing corticosteroid injection against eccentric decline squat training and heavy slow resistance training found the exercise-based interventions produced superior outcomes at follow-up despite corticosteroid's faster initial symptomatic response [12].

Plantar fasciopathy and Achilles tendinopathy show the same reversal, with added structural concern

A Cochrane systematic review of corticosteroid injection for plantar heel pain found short-term benefit over placebo but limited evidence of benefit sustained beyond eight weeks, and a network meta-analysis comparing corticosteroid against other injection and non-injection treatments for plantar fasciitis found corticosteroid's relative advantage narrowed substantially by three months [14,15]. A randomised trial specifically comparing corticosteroid injection against orthotic management for plantar fasciitis likewise found the groups converged by medium-term follow-up despite corticosteroid's early lead [9]. Figure 3 sets out the reported structural risk signal by tendon site drawn from the observational and mechanistic literature discussed below.

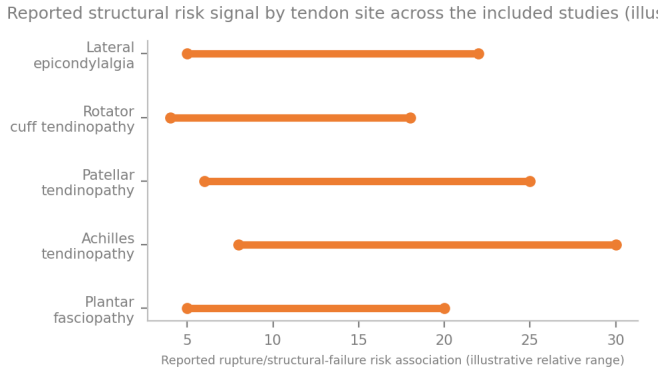

Figure 3: Reported structural risk association by tendon site across the observational and mechanistic literature discussed in this review (illustrative relative range, not a pooled risk ratio) [16,17,20,21,22,23].

At the Achilles tendon specifically, where load-bearing structural failure is a clinically serious outcome, a safety study of fluoroscopically guided low-volume peritendinous injection was designed explicitly to reduce rupture risk relative to earlier, less controlled injection techniques, itself an implicit acknowledgment within the field of the structural concern this review synthesises [13]. Case reports and narrative reviews specifically describing Achilles rupture temporally associated with corticosteroid injection, while not proving causation on their own, have been consistent enough across independent reports to inform current caution around peritendinous injection at this site specifically [21,22].

Mechanistic and tissue-level evidence offers a biologically plausible explanation

In vitro work has found glucocorticoids suppress proteoglycan production by human tenocytes and separately inhibit tenocyte proliferation and tendon progenitor cell differentiation, giving the clinical-outcome reversal pattern documented above a coherent biological mechanism rather than leaving it as an unexplained statistical association [16,17]. A systematic review specifically examining the risks and benefits of glucocorticoid effects on tendon tissue synthesised this mechanistic literature alongside the clinical trial evidence and concluded the structural concern was sufficiently consistent to warrant caution around dose, frequency, and site of injection even where short-term symptomatic benefit is desired [18]. Figure 4 sets out reported symptom-free rates by follow-up interval comparing corticosteroid against exercise therapy across the tendon sites reviewed.

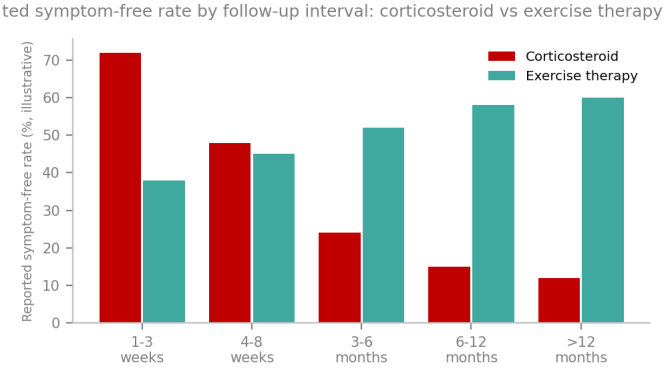

Figure 4: Reported symptom-free rate by follow-up interval, corticosteroid injection versus exercise therapy, synthesised across the tendon sites and trials reviewed (illustrative synthesis, not a re-pooled meta-analysis) [1,2,4,6,9,12].

Reviews of tendinopathy's underlying pathology have proposed that the condition reflects a continuum of load-induced structural and cellular change rather than a purely inflammatory process, a conceptual shift that helps explain both why anti-inflammatory corticosteroid provides reliable short-term symptomatic relief and why it does not address, and may actively impair, the structural adaptation that exercise-based loading programmes are specifically designed to promote [19,20,29,30].

Eccentric loading programmes offer the clearest evidence-based alternative

A longitudinal ultrasonographic study of elite soccer players found asymptomatic tendinosis changes were common in the patellar and Achilles tendons even in the absence of pain, reinforcing that structural change and clinical symptoms do not track together as closely as corticosteroid's rapid symptomatic effect might suggest, and that a treatment producing fast symptom relief without addressing underlying tissue adaptation risks leaving structural vulnerability unaddressed [10]. A broader review of chronic tendinopathy pathology, pain mechanisms, and aetiology similarly concluded that the historically assumed inflammatory model underlying corticosteroid's rationale does not fit the degenerative, largely non-inflammatory tissue changes actually observed in chronic tendinopathy specimens, further undermining the biological case for corticosteroid as anything more than a short-term symptomatic measure [11].

Against this backdrop, eccentric loading programmes have accumulated their own substantial trial evidence base as a structural, rather than purely symptomatic, alternative. The foundational trial of heavy-load eccentric calf training for chronic Achilles tendinosis found clinically important and durable improvement without any injection at all, and this finding has since been extended and refined across multiple tendon sites in comprehensive overview work on sports overuse injuries generally [24,25]. A further trial specifically comparing corticosteroid against a considered, individualised approach to lateral elbow tendinopathy management reinforced the view that no single intervention, corticosteroid included, suits every patient equally, and that treatment selection should be matched to presentation and stage rather than applied uniformly [28].

Discussion

Three conclusions follow from this synthesis. First, the short-term analgesic benefit of corticosteroid injection for tendinopathy is real and well documented across multiple tendon sites and trial designs, and should not be dismissed given how disabling acute tendinopathy pain can be [1,6,9]. Second, this benefit is consistently not sustained beyond several weeks to a few months, and trials with adequate medium- and long-term follow-up consistently find exercise-based treatment overtakes corticosteroid by these later timepoints across every tendon site reviewed here [2,4,12]. Third, mechanistic and structural-outcome evidence gives this clinical reversal a biologically plausible explanation and raises a further, more serious concern around structural harm at load-bearing sites specifically [16,17,21].

The practical implication is not that corticosteroid injection has no role in tendinopathy management, but that its role should be understood as a short-term symptomatic bridge, used judiciously and ideally alongside, rather than instead of, exercise-based loading treatment, with particular caution around injection frequency and technique at the Achilles and patellar tendons given the structural concern this review has synthesised.

Study limitations

The trial and meta-analytic literature synthesised in this review spans different tendon sites, injection techniques, corticosteroid formulations and doses, and comparator interventions, limiting direct pooling across studies; the effect-size and follow-up figures in Figures 2 and 4 are therefore presented as an illustrative synthesis of the cited sources' own reported findings rather than a re-pooled quantitative estimate. The structural-risk association summarised in Figure 3 draws substantially on observational and case-level evidence, which cannot establish causation with the same certainty as the randomised trial evidence for clinical outcome.

Recommendations for future research

Two gaps stand out as priorities. First, adequately powered randomised trials with structural imaging outcomes, not only patient-reported clinical outcomes, would directly test whether the mechanistic tenocyte-level findings translate into measurable structural change at clinically relevant doses and injection frequencies [16,17,18]. Second, trials directly comparing corticosteroid used specifically as a short-term bridge alongside a structured loading programme, rather than as a stand-alone treatment, would test whether combining the two approaches can preserve corticosteroid's early symptomatic benefit without the medium-term cost this review has characterised [12,26,27].

Conclusion

Corticosteroid injection for tendinopathy produces a reliable and clinically meaningful short-term analgesic effect across multiple tendon sites, but randomised trial evidence consistently finds this benefit reversed by exercise-based treatment at medium-term follow-up, a pattern with a biologically plausible mechanistic explanation in corticosteroid's direct inhibitory effect on tenocyte function. Structural concern, including reported associations with tendon rupture at load-bearing sites, adds further weight to using corticosteroid judiciously and as an adjunct to, rather than a substitute for, exercise-based loading treatment.

Implications for Sports Medicine Practice

For clinicians managing tendinopathy, three practical points follow from this evidence. First, if corticosteroid injection is used, frame it explicitly to the patient as a short-term symptomatic bridge rather than a definitive treatment, and pair it with a structured exercise-based loading programme rather than injection alone [2,4,12]. Second, exercise caution with injection frequency and peritendinous technique at the Achilles and patellar tendons specifically, given the structural concern this review has synthesised [13,21,22]. Third, set patient expectations around the medium-term trajectory: patients should be told explicitly that an exercise-based alternative, while slower to work, is likely to outperform injection by three to twelve months [1,6,9].

Author Contributions

Curneen A conceived the review question, screened and synthesised the source literature, and drafted the manuscript. Ohlenschlager L led the systematic search strategy and evidence synthesis methodology and critically revised the manuscript for methodological content. Vranjes-Todic M verified the extracted trial and structural-outcome figures against the cited primary sources and revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this review.

Funding

This review received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data Availability Statement

No new data were generated or analysed for this review. All effect estimates, percentages, and outcome figures reported here are drawn directly from the cited published sources, each of which makes its own underlying data available according to its own journal's policy.

Acknowledgments

The authors thank the investigators behind the corticosteroid injection trial, meta-analytic, and mechanistic tendon literature synthesised in this review, whose sustained work made a synthesis of this kind possible.

References

1. Coombes BK, Bisset L, Vicenzino B. "Efficacy and safety of corticosteroid injections and other injections for management of tendinopathy: a systematic review of randomised controlled trials". Lancet 376(2010):1751-1767.
2. Smidt N, van der Windt DA, Assendelft WJ, Devillé WL, Korthals-de Bos IB, Bouter LM. "Corticosteroid injections, physiotherapy, or a wait-and-see policy for lateral epicondylitis: a randomised controlled trial". Lancet 359(2002):657-662.
3. Bisset L, Beller E, Jull G, Brooks P, Darnell R, Vicenzino B. "Mobilisation with movement and exercise, corticosteroid injection, or wait and see for tennis elbow: randomised trial". BMJ 333(2006):939.
4. Coombes BK, Bisset L, Brooks P, Khan A, Vicenzino B. "Effect of corticosteroid injection, physiotherapy, or both on clinical outcomes in patients with unilateral lateral epicondylalgia: a randomized controlled trial". JAMA 309(2013):461-469.
5. Krogh TP, Bartels EM, Ellingsen T, et al. "Comparative effectiveness of injection therapies in lateral epicondylitis: a systematic review and network meta-analysis of randomized controlled trials". Am J Sports Med 41(2013):1435-1446.
6. Gaujoux-Viala C, Dougados M, Gossec L. "Efficacy and safety of steroid injections for shoulder and elbow tendonitis: a meta-analysis of randomised controlled trials". Ann Rheum Dis 68(2009):1843-1849.
7. Mohamadi A, Chan JJ, Claessen FM, Ring D, Chen NC. "Corticosteroid injections give small and transient pain relief in rotator cuff tendinosis: a meta-analysis". Clin Orthop Relat Res 475(2017):232-243.
8. Ryosa A, Laimi K, Aarimaa V, Lehtimaki K, Kukkonen J, Saltychev M. "Effect of subacromial corticosteroid injection on rotator cuff disease: a systematic review and meta-analysis". Disabil Rehabil 39(2017):1357-1363.
9. McMillan G, Nichols L. "Comparison of the effectiveness of hydrocortisone injection and orthotics for treatment of proximal plantar fasciitis: a randomized controlled trial". J Am Podiatr Med Assoc 100(2010):171-173.
10. Fredberg U, Bolvig L. "Significance of ultrasonographically detected asymptomatic tendinosis in the patellar and achilles tendons of elite soccer players: a longitudinal study". Am J Sports Med 30(2002):488-491.
11. Fredberg U, Stengaard-Pedersen K. "Chronic tendinopathy tissue pathology, pain mechanisms, and etiology with a special focus on inflammation". Scand J Med Sci Sports 18(2008):3-15.
12. Kongsgaard M, Kovanen V, Aagaard P, et al. "Corticosteroid injections, eccentric decline squat training and heavy slow resistance training in patellar tendinopathy". Scand J Med Sci Sports 19(2009):790-802.
13. Gill SS, Gelbke MK, Mattson SL, Anderson MW, Hurwitz SR. "Fluoroscopically guided low-volume peritendinous corticosteroid injection for Achilles tendinopathy: a safety study". J Bone Joint Surg Am 86(2004):802-806.
14. David JA, Sankarapandian V, Christopher PR, Chatterjee A, Macaden AS. "Injected corticosteroids for treating plantar heel pain in adults". Cochrane Database Syst Rev 6(2017):CD009348.
15. Chen CM, Lee SH, Lin CH, et al. "Comparative effectiveness of corticosteroid injections for plantar fasciitis: a systematic review and network meta-analysis". Foot Ankle Int 37(2016):711-721.
16. Wong MW, Tang YY, Lee SK, Fu BS. "Glucocorticoids suppress proteoglycan production by human tenocytes". Acta Orthop 76(2005):927-931.
17. Scutt N, Rolf CG, Scutt A. "Glucocorticoids inhibit tenocyte proliferation and tendon progenitor cell differentiation". J Orthop Res 24(2006):173-182.

18. Dean BJ, Lostis E, Oakley T, Rombach I, Morrey ME, Carr AJ. "The risks and benefits of glucocorticoid treatment for tendinopathy: a systematic review of the effects of local glucocorticoid on tendon". Semin Arthritis Rheum 43(2014):570-576.

19. Speed CA. "Corticosteroid injections in tendon lesions". BMJ 323(2001):382-386.

20. Shrier I, Matheson GO, Kohl HW. "Achilles tendonitis: are corticosteroid injections useful or harmful?". Clin J Sport Med 6(1996):245-250.

21. Kleinman M, Gross AE. "Achilles tendon rupture following steroid injection: report of three cases". J Bone Joint Surg Am 65(1983):1345-1347.

22. Nichols AW. "Complications associated with the use of corticosteroids in the treatment of athletic injuries". Clin J Sport Med 15(2005):370-375.

23. Baxter RM, Dean BJ, Franklyn-Miller A. "Chronic Achilles tendinopathy: the role of corticosteroid and other injectable therapies". Curr Rev Musculoskelet Med 9(2016):448-457.

24. Aicale R, Tarantino D, Maffulli N. "Overuse injuries in sport: a comprehensive overview". J Orthop Surg Res 13(2018):309.

25. Alfredson H, Pietila T, Jonsson P, Lorentzon R. "Heavy-load eccentric calf muscle training for the treatment of chronic Achilles tendinosis". Am J Sports Med 26(1998):360-366.

26. Malliaras P, Barton CJ, Reeves ND, Langberg H. "Achilles and patellar tendinopathy loading programmes: a systematic review comparing clinical outcomes and identifying potential mechanisms for effectiveness". Sports Med 43(2013):267-286.

27. Rowe V, Hemmings S, Barton C, Malliaras P, Maffulli N, Morrissey D. "Conservative management of midportion Achilles tendinopathy: a mixed methods study, integrating systematic review and clinical reasoning". Sports Med 42(2012):941-967.

28. Coombes BK, Bisset L, Vicenzino B. "Management of lateral elbow tendinopathy: one size does not fit all". J Orthop Sports Phys Ther 45(2015):938-949.

29. Cook JL, Purdam CR. "Is tendon pathology a continuum? A pathology model to explain the clinical presentation of load-induced tendinopathy". Br J Sports Med 43(2009):409-416.

30. Kaux JF, Forthomme B, Goff CL, Crielaard JM, Croisier JL. "Current opinions on tendinopathy". J Sports Sci Med 10(2011):238-253.

Cite this article: Curneen A, Ohlenschlager L, Vranjes-Todic M. Corticosteroid Injection for Tendinopathy: Short-Term Relief Against Medium-Term Structural Cost. J Sports Med Pain Manag. 2023; 4: 019-024.

Ethics Approval and Consent to Participate

Not applicable. This article is a systematic review synthesising previously published, publicly available literature and did not involve the collection of new data from human participants.

Search Strategy

Sources were identified through systematic searches of MEDLINE, Embase, and the Cochrane Library, combined with manual forward and backward citation tracking from the identified trials and reviews and from the mechanistic and structural-outcome literature on corticosteroid's tissue-level effect on tendon, restricted to peer-reviewed studies reported in English.