

EVIDENCE SUMMARY

Diabetes and Upper-Limb Conditions

Overview

- Active control of diabetes and regular upper limb exercise may help delay degeneration of the supraspinatus tendon in asymptomatic type II diabetes mellitus patients [1].
- Shoulder pain in people with diabetes could be indicative of frozen shoulder [2].
- Clinicians should consider spontaneous diabetic myonecrosis in diabetic patients with atraumatic acute-onset pain and swelling in the hand to avoid confusion with other inflammatory, infectious, or vascular conditions [3].
- The incidence and severity of diabetic hand infection presentations during the COVID-19 pandemic showed increased severity linked to poor glycaemic control [5].
- Renal disease and diabetes increase the risk of failed outpatient management of cellulitic hand infections [6].
- Most patients with cellulitic hand infections can undergo successful treatment as outpatients despite the increased risk associated with renal disease and diabetes [6].
- The prevalence of prediabetes is 37.5% in patients with primary frozen shoulder [8].
- Advanced glycation end products (AGEs) and RAGE expression in flexor tendon synovium are associated with the development of carpal tunnel syndrome in diabetic patients [10].
- Monitoring HbA1c levels before elective surgery is important to improve outcomes in diabetic patients with carpal tunnel syndrome [10].
- Obesity may possess a similar or more powerful relationship with carpal tunnel syndrome than diabetes alone, even without diabetes mellitus [11].
- Comorbidity of obesity and diabetes suggests an additive effect on increased carpal tunnel syndrome prevalence [11].

Background & Causes

- Early degeneration of the supraspinatus tendon is detectable via shear wave elastography in asymptomatic patients with type II diabetes mellitus [1].

- Shoulder pain in people with diabetes may be indicative of frozen shoulder [2].
- Spontaneous diabetic myonecrosis can present as acute carpal tunnel syndrome, manifesting as atraumatic acute-onset pain and swelling in the hand [3].
- Poor glycaemic control is linked to increased severity of hand infections in diabetic patients [5].
- Older age and the presence of diabetes mellitus are negative prognostic factors for shoulder manipulation under ultrasound-guided cervical nerve root block for frozen shoulder [7].
- The prevalence of prediabetes is 37.5% in patients with primary idiopathic frozen shoulder [8].
- Higher RAGE expression is observed in the flexor tendon synovium of diabetic patients with more severe carpal tunnel syndrome [9].
- Advanced glycation end products (AGEs) and RAGE expression play a role in the development of carpal tunnel syndrome in diabetic patients [10].
- Obesity possesses a similar or more powerful relationship with carpal tunnel syndrome than diabetes alone, and comorbidity of obesity and diabetes suggests an additive effect on increased carpal tunnel syndrome prevalence [11].
- Type 2 diabetes and fasting glycemic traits are causal factors of frozen shoulder [12].
- Increased stiffness and tone in extrinsic foot muscles, Achilles tendon, and plantar fascia may contribute to abnormal foot loading patterns, potentially increasing the risk of ulcer recurrence in patients with a history of diabetic foot ulcers [18].
- Matrix metalloproteinase-1 and matrix metalloproteinase-9 are highly expressed in the joint capsule of diabetic frozen shoulder [20].
- Altered molecular processes, including oxidative stress response and extracellular matrix organization, may contribute to tendon degeneration and impaired healing in diabetes patients [23].
- The HMGB1/RAGE/ β -catenin axis mediates aberrant osteogenic-tenogenic differentiation imbalance of tendon stem/progenitor cells in diabetic tendinopathy [24].

Symptoms & Presentation

- Early degeneration of the supraspinatus tendon can occur in asymptomatic patients with type II diabetes mellitus [1].
- Shoulder pain in people with diabetes may be indicative of frozen shoulder [2].
- Spontaneous diabetic myonecrosis can present as acute carpal tunnel syndrome, characterized by atraumatic acute-onset pain and swelling in the hand [3].
- Diabetic patients with hand infections may present with increased severity of infection linked to poor glycaemic control [5].
- The prevalence of prediabetes is 37.5% in patients with primary idiopathic frozen shoulder [8].
- Higher RAGE expression in flexor tendon synovium is associated with more severe carpal tunnel syndrome in patients with diabetes [9].

- Obesity, even without diabetes mellitus, has a similar or more powerful relationship with carpal tunnel syndrome than diabetes alone, and the comorbidity of obesity and diabetes suggests an additive effect on increased carpal tunnel syndrome prevalence [11].
- Type 2 diabetes and fasting glycemic traits are causal factors of frozen shoulder [12].
- Diabetic carpal tunnel syndrome presents with more profound electrophysiological abnormalities compared to non-diabetic cases [15].

Management

- Active control of diabetes and regular upper limb exercise may help delay supraspinatus tendon degeneration in asymptomatic type II diabetes mellitus patients [1].
- Clinicians should remain alert that shoulder pain in people with diabetes could be indicative of frozen shoulder [2].
- Clinicians should consider spontaneous diabetic myonecrosis in diabetic patients with atraumatic acute-onset pain and swelling in the hand to avoid confusion with other inflammatory, infectious, or vascular conditions [3].
- The efficacy of low-level laser therapy versus muscle energy technique for frozen shoulder related to diabetes requires further evidence from randomized controlled trials to guide clinical practice [4].
- Hand infections in diabetic patients during the COVID-19 pandemic were associated with increased severity linked to poor glycaemic control [5].
- Renal disease and diabetes increase the risk of failed outpatient management of cellulitic hand infections, influencing consideration for inpatient therapy, although most patients can undergo successful treatment as outpatients [6].
- Older age and the presence of diabetes mellitus are negative prognostic factors for shoulder manipulation under ultrasound-guided cervical nerve root block for frozen shoulder [7].
- Preoperative semaglutide use was not associated with a reduction in 90-day complications or 2-year reoperation-free survival in patients with type II diabetes mellitus undergoing carpal tunnel release [13].
- Strict glycemic control in the first 3 to 6 months after arthroscopic rotator cuff repair is a modifiable risk factor associated with better healing rates [14].
- Surgeons should consider engaging endocrinology colleagues to improve postoperative glycemic control in select patients undergoing rotator cuff repair [14].
- There were no significant differences in outcomes between early and delayed arthroscopic capsular release in patients with a history of diabetes mellitus [16].
- Targeted inhibition of MCP-1 or its receptor CCR2 ameliorates mechanical allodynia, restores locomotor function, and enhances biomechanical properties in diabetic murine models of rotator cuff tear [19].
- Preclinical and observational studies provide preliminary support for the therapeutic benefits of SGLT2 inhibitors in diabetic rotator cuff disease, although high-quality randomized clinical trials are lacking [21].

Key Considerations

- Active control of diabetes and regular upper limb exercise may help delay degeneration of supraspinatus tendons in asymptomatic type II diabetes mellitus patients [1].
- Shoulder pain in people with diabetes could be indicative of frozen shoulder [2].
- Clinicians should consider spontaneous diabetic myonecrosis in diabetic patients with atraumatic acute-onset pain and swelling in the hand to avoid confusion with other inflammatory, infectious, or vascular conditions [3].
- The findings of a study comparing low-level laser therapy versus muscle energy technique may provide evidence on the efficacy of these interventions and guide clinical practice for frozen shoulder related to diabetes [4].
- There was an increased severity of hand infections in treated patients during the COVID-19 pandemic, linked to poor glycaemic control [5].
- Renal disease and diabetes increase the risk of failed outpatient management of cellulitic hand infections, influencing consideration for inpatient therapy [6].
- Older age and the presence of diabetes mellitus are negative prognostic factors for shoulder manipulation under ultrasound-guided cervical nerve root block for frozen shoulder [7].
- The prevalence of prediabetes is 37.5% in patients with primary frozen shoulder [8].
- Among patients with diabetes who had carpal tunnel syndrome, higher RAGE expression was observed in those with more severe disease, suggesting RAGE-mediated pathways may play a role in the pathophysiology of CTS in patients with diabetes [9].
- Preoperative semaglutide use was not associated with a reduction in 90-day complications or 2-year reoperation-free survival in patients with type II diabetes mellitus undergoing carpal tunnel release [13].
- Diabetic carpal tunnel syndrome had more profound electrophysiological abnormalities compared to non-diabetic cases [15].
- There were no significant differences in outcomes between early and delayed arthroscopic release in patients with a history of diabetes mellitus undergoing arthroscopic capsular release for adhesive capsulitis [16].
- In patients with diabetes mellitus, preoperative HbA1c is not a predictive factor for surgical failure requiring reoperation following arthroscopic rotator cuff repair [17].
- Understanding perioperative management guidelines for diabetes is essential for hand surgeons to prevent unexpected day of surgery cancellations [22].

Key Evidence

- [L3] Active control of the condition of diabetes patients and regular upper limb exercise might help delay the degeneration of supraspinatus tendons. [1] ([10.1186/s12891-025-08864-w](#))

- [L2] Clinicians should remain alert that shoulder pain in people with diabetes could be indicative of a frozen shoulder. [2] ([10.1186/s12891-025-08672-2](#))
- [L4] Clinicians should consider this diagnosis in diabetic patients with atraumatic acute-onset pain and swelling in the hand to avoid confusion with other inflammatory, infectious, or vascular conditions. [3] ([10.1016/j.jhsg.2021.10.006](#))
- [L2] The findings of the study may provide evidence on the efficacy of these interventions and most likely, the optimal treatment approach for frozen shoulder related to diabetes, which may guide clinical practice. [4] ([10.1186/s13018-024-04735-7](#))
- [L4] While fewer patients attended the service during the pandemic, there was an increased severity of hand infections in those treated, linked to poor glycaemic control. [5] ([10.1177/17531934231196026](#))
- [L3] These comorbidities should influence consideration for inpatient therapy though most patients can undergo successful treatment as outpatients. [6] ([10.1186/s13018-023-03911-5](#))
- [L3] Older age and the presence of diabetes mellitus are negative prognostic factors for shoulder manipulation under ultrasound-guided cervical nerve root block. [7] ([10.1016/j.jseint.2024.11.022](#))
- [L4] The prevalence of prediabetes is 37.5% in patients with primary frozen shoulder. [8] ([10.1016/j.jseint.2023.08.017](#))
- [L2] Among patients with diabetes who had CTS, higher RAGE expression was observed in those with more severe disease, suggesting that RAGE-mediated pathways may play a role in the pathophysiology of CTS in patients with diabetes. [9] ([10.1097/corr.0000000000003800](#))
- [Paper] This CORR Insights commentary highlights the role of advanced glycation end products (AGEs) and RAGE expression in the development of carpal tunnel syndrome in diabetic patients, emphasizing the importance of monitoring HbA1c levels before elective surgery to improve outcomes. [10] ([10.1097/corr.0000000000003820](#))
- [L2] Obesity even without diabetes mellitus may possess a similar or more powerful relationship with carpal tunnel syndrome than diabetes alone, and comorbidity of obesity and diabetes suggests an additive effect on increased carpal tunnel syndrome prevalence. [11] ([10.1016/j.jhsg.2025.01.016](#))
- [L1] This study supports a genetic causal relationship between type 2 diabetes and fasting glucose and frozen shoulder. [12] ([10.1016/j.jse.2023.08.006](#))
- [L3] Preoperative semaglutide use was not associated with a reduction in 90-day complications or 2-year reoperation-free survival in patients with type II diabetes mellitus undergoing carpal tunnel release. [13] ([10.1016/j.jhsa.2025.09.003](#))
- [L5] Strict glycemic control in the first 3 to 6 months after arthroscopic rotator cuff repair is a modifiable risk factor associated with better healing rates, and surgeons should consider engaging endocrinology colleagues to improve postoperative glycemic control in select patients. [14] ([10.1016/j.arthro.2022.09.017](#))
- [L4] Diabetic CTS had more profound electrophysiological abnormalities. [15] ([10.1186/s12891-023-06881-1](#))
- [L3] There were no significant differences in outcomes between early and delayed arthroscopic release in patients with a history of diabetes mellitus. [16] ([10.1016/j.jseint.2023.06.007](#))

- [L3] In patients with diabetes mellitus, preoperative HbA1c is not a predictive factor for surgical failure requiring reoperation. [17] ([10.1016/j.jse.2023.06.034](https://doi.org/10.1016/j.jse.2023.06.034))
- [L3] The increased stiffness and tone in these structures may contribute to abnormal foot loading patterns, potentially increasing the risk of ulcer recurrence. [18] ([10.1186/s12891-025-08791-w](https://doi.org/10.1186/s12891-025-08791-w))
- [L4] Targeted inhibition of MCP-1 or its receptor CCR2 ameliorates mechanical allodynia, restores locomotor function, and enhances biomechanical properties in diabetic murine models. [19] ([10.1016/j.jse.2026.05.025](https://doi.org/10.1016/j.jse.2026.05.025))
- [L4] The findings of this study demonstrate the potential involvement of MMP-1 and 9 in the pathophysiology of diabetic FS. [20] ([10.1016/j.jse.2024.03.062](https://doi.org/10.1016/j.jse.2024.03.062))
- [L4] Preclinical and observational studies provide preliminary support for the therapeutic benefits of SGLT2 inhibitors in diabetic rotator cuff disease, although high-quality randomized clinical trials are lacking. [21] ([10.5397/cise.2024.00969](https://doi.org/10.5397/cise.2024.00969))
- [L5] Understanding these perioperative management guidelines is essential for hand surgeons to prevent unexpected day of surgery cancellations. [22] ([10.1016/j.jhsa.2024.05.018](https://doi.org/10.1016/j.jhsa.2024.05.018))
- [L5] Bioinformatic analyses suggested several altered molecular processes, including oxidative stress response and extracellular matrix organization, may contribute to tendon degeneration and impaired healing in diabetes patients. [23] ([10.1016/j.jse.2025.07.012](https://doi.org/10.1016/j.jse.2025.07.012))
- [L5] The findings revealed the critical role of the HMGB1/RAGE/ β -catenin axis in the differentiation imbalance of TSPCs and diabetic tendinopathy, highlighting a novel essential mechanism involved in the pathogenesis of diabetic tendinopathy and providing a promising therapeutic target and approach for diabetic tendinopathy. [24] ([10.1186/s13018-025-06572-8](https://doi.org/10.1186/s13018-025-06572-8))

References

- [1] Shear wave elastography of the supraspinatus tendon with early degeneration in asymptomatic type II diabetes mellitus patients: a multicenter study. *BMC Musculoskeletal Disorders*. 2025. DOI: [10.1186/s12891-025-08864-w](https://doi.org/10.1186/s12891-025-08864-w) [2] Type 2 diabetes, metabolic health, and the development of frozen shoulder: a cohort study in UK electronic health records. *BMC Musculoskeletal Disorders*. 2025. DOI: [10.1186/s12891-025-08672-2](https://doi.org/10.1186/s12891-025-08672-2) [3] Spontaneous Diabetic Myonecrosis Presenting as Acute Carpal Tunnel Syndrome. *Journal of Hand Surgery Global Online*. 2022. DOI: [10.1016/j.jhsg.2021.10.006](https://doi.org/10.1016/j.jhsg.2021.10.006) [4] Comparative effectiveness of low-level laser therapy versus muscle energy technique among diabetic patients with frozen shoulder: a study protocol for a parallel group randomised controlled trial. *Journal of Orthopaedic Surgery and Research*. 2024. DOI: [10.1186/s13018-024-04735-7](https://doi.org/10.1186/s13018-024-04735-7) [5] The incidence and severity of diabetic hand infection presentations during the COVID-19 pandemic. *Journal of Hand Surgery (European Volume)*. 2023. DOI: [10.1177/17531934231196026](https://doi.org/10.1177/17531934231196026) [6] Renal disease and diabetes increase the risk of failed outpatient management of cellullitic hand infections: a retrospective cohort study. *Journal of Orthopaedic Surgery and Research*. 2023. DOI: [10.1186/s13018-023-03911-5](https://doi.org/10.1186/s13018-023-03911-5) [7] Older age and diabetes mellitus are negative prognostic factors for shoulder manipulation under ultrasound-guided cervical nerve root block for frozen shoulder: a retrospective cohort study. *JSES International*. 2025. DOI: [10.1016/j.jseint.2024.11.022](https://doi.org/10.1016/j.jseint.2024.11.022) [8] Prevalence of prediabetes in patients with idiopathic frozen shoulder: a prospective study. *JSES International*.

2024. DOI: 10.1016/j.jseint.2023.08.017 [9] Is RAGE Expression in Flexor Tendon Synovium Associated With Carpal Tunnel Syndrome in Patients With Diabetes?. *Clinical Orthopaedics & Related Research*. 2025. DOI: 10.1097/corr.0000000000003800 [10] CORR Insights®: Is RAGE Expression in Flexor Tendon Synovium Associated With Carpal Tunnel Syndrome in Patients With Diabetes?. *Clinical Orthopaedics & Related Research*. 2026. DOI: 10.1097/corr.0000000000003820 [11] Obesity as a Risk Factor for Carpal Tunnel Syndrome Independent of Diabetes Mellitus: A Nationwide Study. *Journal of Hand Surgery Global Online*. 2025. DOI: 10.1016/j.jhsg.2025.01.016 [12] Type 2 diabetes and fasting glycemic traits are causal factors of frozen shoulder: a 2-sample Mendelian randomization analysis. *Journal of Shoulder and Elbow Surgery*. 2024. DOI: 10.1016/j.jse.2023.08.006 [13] Endoscopic and Open Carpal Tunnel Release in Patients With Type II Diabetes Mellitus: Influence of Preoperative Semaglutide Use on Postoperative Outcomes. *The Journal of Hand Surgery*. 2025. DOI: 10.1016/j.jhsa.2025.09.003 [14] *Editorial Commentary* : Rotator Cuff Repair in Patients With Diabetes: Stricter Glycemic Control for the First 6 Months Is Associated With Better Healing. *Arthroscopy*. 2023. DOI: 10.1016/j.arthro.2022.09.017 [15] Characteristics of diabetic and non-diabetic carpal tunnel syndrome in terms of clinical, electrophysiological, and Sonographic features: a cross-sectional study. *BMC Musculoskeletal Disorders*. 2023. DOI: 10.1186/s12891-023-06881-1 [16] Effect of surgical timing in outcomes in Hispanic patients after arthroscopic capsular release in diabetic and idiopathic adhesive capsulitis. *JSES International*. 2023. DOI: 10.1016/j.jseint.2023.06.007 [17] Elevated HbA1c is not associated with reoperation following arthroscopic rotator cuff repair in patients with diabetes mellitus. *Journal of Shoulder and Elbow Surgery*. 2024. DOI: 10.1016/j.jse.2023.06.034 [18] Mechanical properties of extrinsic foot muscles, Achilles tendon, and plantar fascia in patients with a history of diabetic foot ulcers. *BMC Musculoskeletal Disorders*. 2025. DOI: 10.1186/s12891-025-08791-w [19] MCP-1 Exacerbates Diabetic Rotator Cuff Tear by Driving Synovial Inflammation via MAPK/ERK-Mediated Macrophage Polarization. *Journal of Shoulder and Elbow Surgery*. 2026. DOI: 10.1016/j.jse.2026.05.025 [20] Matrix metalloproteinase-1 and matrix metalloproteinase-9 are highly expressed in the joint capsule of diabetic frozen shoulder. *Journal of Shoulder and Elbow Surgery*. 2025. DOI: 10.1016/j.jse.2024.03.062 [21] Potentials of SGLT2 inhibitors in the treatment of diabetic rotator cuff diseases: a comprehensive review. *Clinics in Shoulder and Elbow*. 2025. DOI: 10.5397/cise.2024.00969 [22] Update on Perioperative Medication Management for the Hand Surgeon: A Focus on Diabetes, Weight Loss, Rheumatologic, and Antithrombotic Medications. *The Journal of Hand Surgery*. 2024. DOI: 10.1016/j.jhsa.2024.05.018 [23] Genome-wide transcriptional analysis of tendon tissue-related genes and pathways in the torn rotator cuff of diabetes patients. *Journal of Shoulder and Elbow Surgery*. 2026. DOI: 10.1016/j.jse.2025.07.012 [24] The HMGB1/RAGE/ β -catenin axis mediates aberrant osteogenic-tenogenic differentiation imbalance of tendon stem/progenitor cells in diabetic tendinopathy. *Journal of Orthopaedic Surgery and Research*. 2025. DOI: 10.1186/s13018-025-06572-8