

QUESTION 2: Does routine screening for diabetes and glycemic control reduce the risk of surgical site infection/periprosthetic joint infection (SSI/PJI)?

RECOMMENDATION: The routine screening for diabetes and glycemic control has the potential to reduce the incidence of SSI and/or PJI following total joint arthroplasty (TJA).

LEVEL OF EVIDENCE: Consensus

DELEGATE VOTE: Agree: 96%, Disagree: 3%, Abstain: 1% (Unanimous, Strongest Consensus)

RATIONALE

The burden of diabetes is rising, and it is projected that in the next 20 years the number of diabetics in the United States will reach 44 million, about two times the present prevalence [1,2]. Patients with diabetes, especially those with inadequate glycemic control, are at increased risk for both joint-related and systemic adverse outcomes following TJA [3–6], of which PJI has been the most studied. Multiple professional organizations have published screening recommendations for diabetes [7–10]. While there are slight differences between them, they all agree that patients with an increased risk for diabetes should be screened. It has been found that a large proportion of patients undergoing TJA have undiagnosed diabetes; hence, it is reasonable to provide screening recommendations for this patient population [11].

Diabetes is an established risk factor for severe osteoarthritis [12], and a higher prevalence has been reported in patients undergoing TJA [13,14]. In a recent study, the prevalence of diabetes in patients undergoing TJA was 20.7%, which is almost two times the rate within the general population [15,16]. Interestingly, 40.9% (8.4% of the total cohort) were undiagnosed. Moreover, 38.4% of the total cohort were pre-diabetic, resulting in a total of 59.1% dysglycemic patients. This could explain why numerous studies show that perioperative hyperglycemia, elevated glycated hemoglobin (HbA1c) and high glucose variability are associated with PJI even without a diagnosis of diabetes, as these patients are simply unaware of their dysglycemic status [17–19].

The fact that individuals approaching TJA undergo preadmission testing provides an ideal screening setting, for both patient and physician. Screening TJA patients for diabetes could allow early detection and rapid treatment, which may reduce the burden of diabetes and both its surgical and non-surgical complications. Furthermore, patients with inadequate glycemic control and undiagnosed diabetes may be treated and appropriately optimized in the preoperative setting which could improve their outcomes. Furthermore, lifestyle changes and pharmacologic interventions may reduce progression and delay development in undiagnosed diabetics and pre-diabetics [7,20,21].

Although no studies exist to show that tight glycemic control could reduce the rate of PJI following TJA, it is well-established that inadequately-controlled diabetes is associated with higher rates of PJI. Based on the potential link between strict glycemic control in the perioperative period and reduction in PJI rates, and due to the extremely high rate of unknown diabetics and prediabetics in patients undergoing TJA, we extrapolate that screening all patients prior to surgery could assist in reducing the incidence of SSI and PJI.

REFERENCES

- [1] Huang ES, Basu A, O'Grady M, Capretta JC. Projecting the future diabetes population size and related costs for the U.S. *Diabetes Care*. 2009;32:2225–2229. doi:10.2337/dc09-0459.
- [2] GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016;388:1545–1602. doi:10.1016/S0140-6736(16)31678-6.
- [3] Bolognesi MP, Marchant MH, Viens NA, Cook C, Pietrobbon R, Vail TP. The impact of diabetes on perioperative patient outcomes after total hip and total knee arthroplasty in the United States. *J Arthroplasty*. 2008;23:92–98. doi:10.1016/j.arth.2008.05.012.
- [4] Marchant MH, Viens NA, Cook C, Vail TP, Bolognesi MP. The impact of glycemic control and diabetes mellitus on perioperative outcomes after total joint arthroplasty. *J Bone Joint Surg Am*. 2009;91:1621–1629. doi:10.2106/JBJS.H.00116.
- [5] Meding JB, Reddeman K, Keating ME, Klay A, Ritter MA, Faris PM, et al. Total knee replacement in patients with diabetes mellitus. *Clin Orthop Relat Res*. 2003;208–216. doi:10.1097/01.blo.0000093002.90435.56.
- [6] Fisher DA, Dierckman B, Watts MR, Davis K. Looks good but feels bad: factors that contribute to poor results after total knee arthroplasty. *J Arthroplasty*. 2007;22:39–42. doi:10.1016/j.arth.2007.04.011.
- [7] Siu AL, U S Preventive Services Task Force. Screening for abnormal blood glucose and type 2 diabetes mellitus: U.S. Preventive Services Task Force Recommendation Statement. *Ann Intern Med*. 2015;163:861–868. doi:10.7326/M15-2345.
- [8] Handelsman Y, Bloomgarden ZT, Grunberger G, Umpierrez G, Zimmerman RS, Bailey TS, et al. American Association of Clinical Endocrinologists and American College of Endocrinology – clinical practice guidelines for developing a diabetes mellitus comprehensive care plan – 2015. *Endocr Pract*. 2015;21 Suppl 1:1–87. doi:10.4158/EP15672.GL.
- [9] American Diabetes Association. (2) Classification and diagnosis of diabetes. *Diabetes Care*. 2015;38 Suppl:S8–S16. doi:10.2337/dc15-S005.
- [10] Pottie K, Jaramillo A, Lewin G, Dickinson J, Bell N, et al. Recommendations on screening for type 2 diabetes in adults. *CMAJ*. 2012;184:1687–1696. doi:10.1503/cmaj.120732.
- [11] Shohat N, Goswami K, Tarabichi M, Sterbis E, Tan TL, Parvizi J. All patients should be screened for diabetes before total joint arthroplasty. *J Arthroplasty*. 2018;33:2057–2061. doi:10.1016/j.arth.2018.02.047.
- [12] Schett G, Kleyer A, Perricone C, Sahinbegovic E, Iagnocco A, Zwerina J, et al. Diabetes is an independent predictor for severe osteoarthritis: results from a longitudinal cohort study. *Diabetes Care*. 2013;36:403–409. doi:10.2337/dc12-0924.
- [13] King KB, Findley TW, Williams AE, Bucknell AL. Veterans with diabetes receive arthroplasty more frequently and at a younger age. *Clin Orthop Relat Res*. 2013;471:3049–3054. doi:10.1007/s11999-013-3026-3.
- [14] Capozzi JD, Lepkowsky ER, Callari MM, Jordan ET, Koenig JA, Sirounian GH. The prevalence of diabetes mellitus and routine hemoglobin A1c screening in elective total joint arthroplasty patients. *J Arthroplasty*. 2017;32:304–308. doi:10.1016/j.arth.2016.06.025.
- [15] Menke A, Casagrande S, Geiss L, Cowie CC. Prevalence of and trends in diabetes among adults in the United States, 1988–2012. *JAMA*. 2015;314:1021–1029. doi:10.1001/jama.2015.10029.
- [16] Dwyer-Lindgren L, Mackenbach JP, van Lenthe FJ, Flaxman AD, Mokdad AH. Diagnosed and undiagnosed diabetes prevalence by county in the U.S., 1999–2012. *Diabetes Care*. 2016;39:1556–1562. doi:10.2337/dc16-0678.
- [17] Maradit Kremers H, Schleck CD, Lewallen EA, Larson DR, Van Wijnen AJ, Lewallen DG. Diabetes mellitus and hyperglycemia and the risk of aseptic loosening in total joint arthroplasty. *J Arthroplasty*. 2017;32:S251–S253. doi:10.1016/j.arth.2017.02.056.

- [18] Mraovic B, Suh D, Jacovides C, Parvizi J. Perioperative hyperglycemia and postoperative infection after lower limb arthroplasty. *J Diabetes Sci Technol*. 2011;5:412–418.
- [19] Chrastil J, Anderson MB, Stevens V, Anand R, Peters CL, Pelt CE. Is hemoglobin A1c or perioperative hyperglycemia predictive of periprosthetic joint infection or death following primary total joint arthroplasty? *J Arthroplasty*. 2015;30:1197–1202. doi:10.1016/j.arth.2015.01.040.
- [20] Selph S, Dana T, Blazina I, Bougatsos C, Patel H, Chou R. Screening for type 2 diabetes mellitus: a systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2015;162:765–776. doi:10.7326/M14–2221.
- [21] Gillies CL, Abrams KR, Lambert PC, Cooper NJ, Sutton AJ, Hsu RT, et al. Pharmacological and lifestyle interventions to prevent or delay type 2 diabetes in people with impaired glucose tolerance: systematic review and meta-analysis. *BMJ*. 2007;334:299. doi:10.1136/bmj.39063.689375.55.

