

股関節および膝関節の初回置換術における術前の血糖コントロール (HbA1c) と早期アウトカムとの関連

Association between preoperative glycaemic control (HbA1c) and early outcomes following primary hip and knee arthroplasty

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Aims:

This study investigates the relationship between diabetes mellitus (DM), glycated haemoglobin (HbA1c), and postoperative outcomes among patients undergoing hip and knee arthroplasty.

Methods:

We conducted a single-centre cohort study of patients who underwent primary hip or knee arthroplasty between June 2008 and December 2019 and for whom preoperative HbA1c had been recorded. Cases were categorized by preoperative HbA1c as ‘diabetes’ (≥ 48 mmol/mol), ‘prediabetes’ (≥ 42 mmol/mol and < 48 mmol/mol), ‘no diabetes’ (< 42 mmol/mol), or in ‘remission’ (preoperative HbA1c < 42 mmol/mol but having a historic HbA1c result ≥ 42 mmol/mol). Multivariable logistic regression and restricted cubic splines were used to examine the association between diabetes status, HbA1c, and early postoperative outcomes.

Results:

Analysis of 9,454 procedures (18.4% diabetes, 23.5% prediabetes, 49.7% no diabetes, 8.4% in remission) revealed that DM was associated with a 50% greater likelihood of experiencing one or more postoperative complications (odds ratio (OR) 1.47 (95% CI 1.26 to 1.71)), a 60% greater risk of acute kidney injury or electrolyte abnormality (OR 1.57 (95% CI 1.33 to 1.87)), and more than double the risk of postoperative urinary tract infection (OR 2.25 (95% CI 1.15 to 4.52)) and deep surgical site infection (OR 2.03 (95% CI 1.05 to 3.86)) compared to individuals without diabetes. There was a substantial increase in complication risk as HbA1c entered prediabetes range with no evidence of a plateau or threshold effect, and a profound reduction in the risk of almost all recorded complications for patients in remission from previously elevated HbA1c.

Conclusion:

DM was associated with an increased risk of almost all measured early postoperative complications. Interventions to reduce elevated HbA1c, to any degree, may benefit patient outcomes, however these must be balanced with the risk of iatrogenic harm.

目的:

この研究の目的は、股関節および膝関節の置換術を受ける患者における糖尿病(DM)、糖化ヘモグロビン(HbA1c)、術後アウトカムの関連を検討することである。

方法:

2008年6月～2019年12月に股関節および膝関節の初回置換術を受け、術前HbA1cが記録された患者の単一施設コホート研究を行った。患者を、術前HbA1c別に「糖尿病(48 mmol/mol以上)」、「前糖尿病(42 mmol/mol以上かつ48 mmol/mol未満)」、「非糖尿病(42 mmol/mol未満)」、「寛解状態(術前HbA1cは42 mmol/mol未満であるが、過去にHbA1cが42 mmol/mol以上であった)」に分類した。多変量ロジスティック回帰と制限付き三次スプラインを用いて、糖尿病の状態、HbA1c、術後早期のアウトカムの関連を検討した。

結果:

手術9,454件(糖尿病18.4%、前糖尿病23.5%、非糖尿病49.7%、寛解状態8.4%)を解析したところ、DM患者は非糖尿病患者と比較して、1つ以上の術後合併症を発現する確率の50%上昇(オッズ比[OR] 1.47 [95%信頼区間[CI] 1.26～1.71])、急性腎障害または電解質異常のリスクの60%上昇(OR 1.57 [95% CI 1.33～1.87])、術後尿路感染(OR 2.25 [95% CI 1.15～4.52])および深部手術部位感染(OR 2.03 [95% CI 1.05～3.86])のリスクの2倍超上昇と関連することが明らかになった。HbA1cが前糖尿病の範囲であると合併症リスクが大幅に上昇し、リスクがプラトーに達することはなく、閾値効果も認められなかった。しかし過去のHbA1c高値から寛解した患者では、記録されたほぼすべての合併症についてリスクの顕著な低下が認められた。[多変量ロジスティック回帰解析][χ^2 検定, Fisher 正確検定, 一元配置分散分析(ANOVA), Kruskal-Wallis 検定]

結論:

DMは、調査対象としたほぼすべての術後早期合併症のリスク上昇と関連した。高値のHbA1cを低下させる介入は、程度の差はあれ患者のアウトカムに有益となる可能性があるが、医原性の害のリスクとのバランスをとらなければならない。

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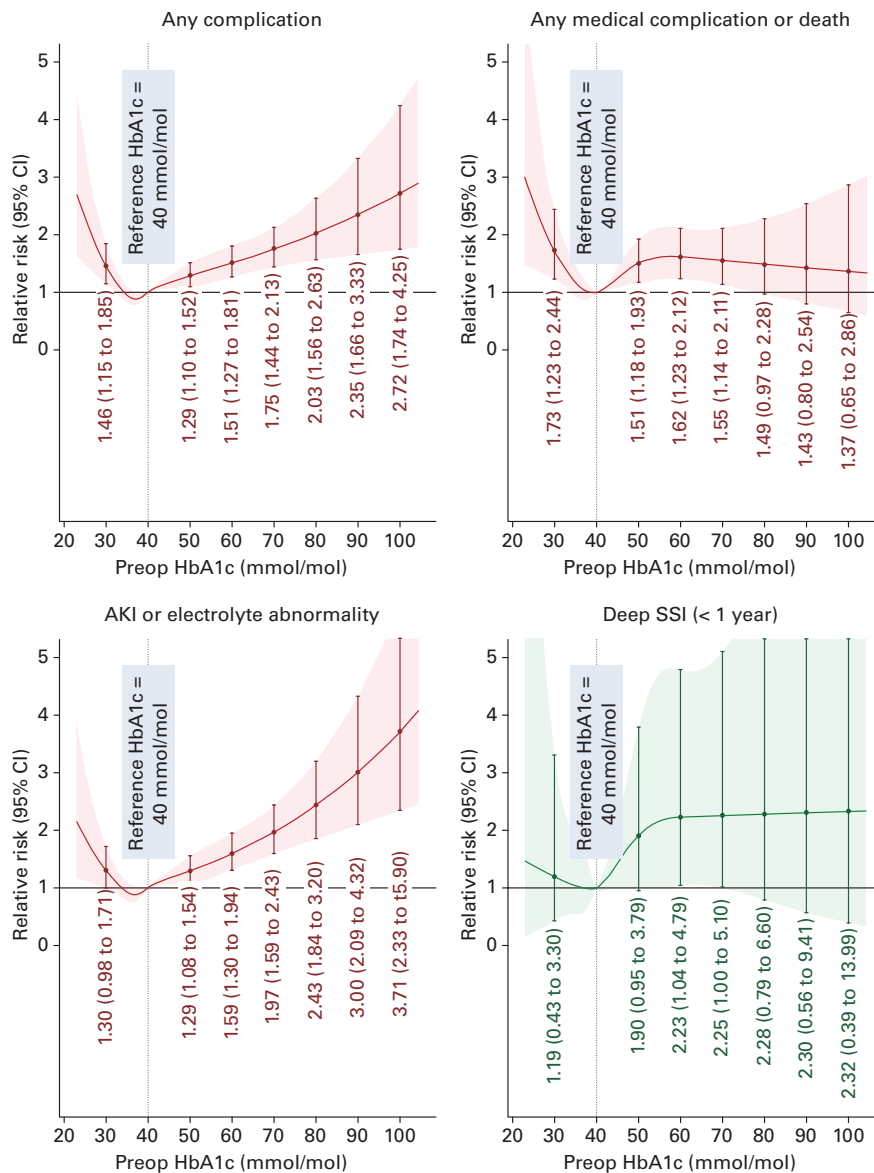


Fig. 3

Association between preoperative glycated haemoglobin (HbA1c) level and modelled relative risk of composite postoperative complications and deep surgical site infection (SSI). Plot matrix showing the association between change in HbA1c level and the modelled relative risk of postoperative outcomes following primary hip and knee arthroplasty after adjustment for confounding factors (age, sex, American Society of Anesthesiologists (ASA) grade, procedure, and time). Adjustment variables were considered to be at their reference values according to the model, except for time, where the most recent period was used. Line and shaded area represent the modelled relative risk and 95% CI relative to the baseline risk of an individual with an HbA1c = 40 mmol/mol (the median HbA1c for the entire cohort). Annotations indicate the modelled relative risk (and 95% CI) for increments of 10 mmol/mol HbA1c, illustrated by the corresponding point and error bar. Example interpretation: an individual with a preoperative HbA1c of 70 mmol/mol was at 75% greater risk (relative risk 1.75 (95% CI 1.44 to 2.13)) of suffering 'any complication' compared to an individual with HbA1c = 40 mmol/mol. AKI, acute kidney injury; ICD, International Classification of Diseases (version 10). An additional figure is available with percentage units in the Supplementary Material.