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HbA1c Levels Do Not Affect Long-Term Outcome After Open Trigger Finger Release in Individuals With Diabetes Mellitus

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Abstract

Background: Trigger finger surgery typically has a successful outcome, also in patients with diabetes mellitus (DM). However, the impact of glycemic control on long-term outcomes after open trigger finger release (OTFR) remains unclear. This study examines whether high hemoglobin A1c (HbA1c) levels affect patient-reported outcome (PRO) following OTFR in individuals with type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM). **Methods:** Data from 2010 to 2020 were sourced from the Swedish national quality register for hand surgery (HAKIR) and cross-linked with the Swedish National Diabetes Register. Adults ≥18 years undergoing OTFR were included. Patient-reported outcomes were assessed using the Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) and HAKIR Questionnaire-8 (HQ-8) questionnaires (evaluating stiffness, pain, and satisfaction) preoperatively and at 3 and 12 months postsurgery. Participants were stratified into tertiles based on mean HbA1c: "optimal control" (≤48 mmol/mol), "acceptable control" (48.1-64 mmol/mol), and "poor control" (>64 mmol/mol). Linear mixed model regression, adjusted for sex, age, DM duration, smoking, mean arterial pressure, body mass index, and physical activity, analyzed outcomes over time, using "acceptable control" group as reference. To adjust for multiple comparisons, a Bonferroni correction was used. **Results:** In total, 496 individuals with T1DM and 869 individuals with T2DM underwent OTFR and were registered in HAKIR. Of these, 53% (n = 710) answered at least 1 questionnaire. There was no difference in QuickDASH nor the studied HQ-8 between the different HbA1c groups at 12 months, neither in individuals with T1DM nor T2DM. **Conclusion:** Poor glycemic control was not associated with worse PRO 12 months after OTFR. Thus, for long-term outcome, preoperative HbA1c testing does not seem to be necessary.

Keywords: diabetes mellitus, diabetic hand, trigger finger, PROM

Introduction

Trigger finger, a diagnosis characterized by a typical locking sensation of a flexed finger or thumb, usually has a successful outcome after surgery, also among individuals with diabetes mellitus (DM).[1] It has a prevalence around 2%[2] but substantially higher in individuals with both type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM).[3] Risk factors for trigger finger include DM[4] and rheumatoid arthritis,[5] but recently, also genetic influence[2,6] has been highlighted. Standard clinical treatment protocol generally involves splinting by an occupational therapist followed by corticosteroid injection and subsequently open trigger finger release (OTFR), and remains consistent for individuals with and without DM.[7,8]

Hemoglobin A1c (HbA1c) is a widely used marker of long-term glycemic control, reflecting average blood glucose levels over the past 2 to 3 months.[9] Elevated HbA1c levels are associated with a higher risk of complications in various types of surgery.[10-12] Previous research

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have shown that patients with a high HbA1c experience delayed wound healing and increased rates of postoperative complications after elective hand surgery.[13] This is particularly relevant for patients with DM undergoing OTFR, where optimal tissue healing is important for functional recovery. Recently, a call to define cut-off values of HbA1c in elective hand surgery has been proposed, since complications, particularly surgical site infections (SSIs) after OTFR, are more prevalent in individuals with DM.[14,15] A high HbA1c value could thus act as a warning sign, potentially delaying surgery until better glycemic control has been achieved.

However, whether strict glycemic control affects *long-term* patient-reported outcome (PRO) after OTFR is still unknown. Thus, the aim of this study was to analyze the impact of high Hb1Ac levels on PRO after OTFR in patients with T1DM and T2DM.

Methods

Data Sources and Study Population

In this study, we used cross-linked data from the National Diabetes Register (NDR) together with data from the Swedish National Quality Registry for Hand Surgery (HAKIR), focusing on patients with T1DM and T2DM. Swedish National Quality Registry for Hand Surgery was initiated in 2010 and includes all 7 hospitals with a hand surgical unit, as well as several private units in Sweden.[16] In 2022, more than 90% of all surgeries conducted at the participating units were recorded in HAKIR. The registry includes details such as the patient's sex, age, and the operated side, along with the total number of operations each patient has undergone.

Patients are asked to fill out 2 types of patient-reported outcome measures (PROMs). The first PROM is the Swedish version of the Quick Disabilities of the Arm, Shoulder, and Hand Questionnaire (QuickDASH),[17] which consists of 11 questions and results in a disability score ranging from 0 to 100, where a higher score signifies greater disability. The second PROM is the HAKIR Questionnaire-8 (HQ-8), a validated 8-item questionnaire specifically designed for HAKIR.[18] It assesses pain during load, pain during movement without load, pain at rest, stiffness, weakness, numbness, cold sensitivity, and the ability to perform daily activities at 3 and 12 months postsurgery. In addition, the HQ-8 questionnaire includes a post-surgery question regarding the overall outcome (0-100). The data from HAKIR were subsequently cross-referenced with the Swedish NDR, which provides yearly data on diabetes type, medications, complications, and risk factors. Currently, the NDR covers 85% to 90% of all individuals with DM in Sweden and has been comprehensively described, including variable definitions, in prior publications.[19,20]

Inclusion and Exclusion Criteria

For this study, only individuals with T1DM or T2DM, registered in NDR during the inclusion period of 2010-2020, who underwent a first-time OTFR (International Classification of Diseases 10th version (ICD-10) code M653 together with the surgical code NDM49) were included. Furthermore, only the responses in HQ-8 related to pain during load (HQ-1), pain during motion without load (HQ-2), stiffness (HQ-4), overall outcome (HQ-9), as well as QuickDASH scores were analyzed. Individuals undergoing several surgical procedures, for example, open carpal tunnel release, as well as those undergoing OTFR before their diagnosis of DM were excluded. Finally, only individuals who had at least 1 measurement of QuickDASH, or one of the selected HQ-8 questions, were included in the analysis (n = 710 patients).

Statistical Analysis

The quantitative data in Table 1 were expressed as mean ± standard deviation (SD) or median with interquartile range when normally or skewed distributed, respectively. As T1DM and T2DM differ considerably in pathophysiology, metabolic profile, and complication patterns, all analyses were stratified by diabetes type. Individuals were thereafter divided into tertiles according to their individual mean HbA1c, using cut-off lines for optimal control ≤48 mmol/mol, acceptable control 48.1 to 64 mmol/mol, and poor control >64 mmol/mol, an adaptation of the National Institute for Health and Care Excellence guidelines and the American Diabetes Association guidelines for glycemic targets.[21,22] Hemoglobin A1c values are presented, according to International Federation of Clinical Chemistry and Laboratory Medicine, in millimoles per mole[23] (48 mmol/mol = 6.5%) which is the standard unit in Sweden and in the NDR. An individual's mean value of all registered HbA1c levels in NDR was chosen to better reflect the long-term glycemic control rather than a single value and thus acts as the main exposure. However, in the sensitivity analysis, the HbA1c level from the same year as surgery was chosen as exposure, keeping all other models the same, and analyzed.

Linear mixed models with an autoregressive (AR)(1) covariance structure and subject as random effect were then applied to model how PROMs evolved over time (pre-op, after 3 months, and after 12 months) in the respective group. The first model was adjusted for age and sex. The second model was adjusted for age, sex, number of years with diabetes, smoking status, mean arterial pressure, body mass index (BMI), and physical activity. Results were presented as estimated means with 95% confidence intervals with corresponding *P* values for comparison, using individuals with "acceptable HbA1c" as the reference group. To adjust for multiple comparisons, a Bonferroni correction was used. A *P* value of <.05 was considered statistically significant. All

Table 1. Patient Characteristics for Individuals With T1DM and T2DM, Stratified for HbA1c Group Including Missing Data (%).

Diabetes type	Type 1 diabetes[a]		Type 2 diabetes		
HbA1c group	Acceptable (N = 202)	Poor (N = 287)	Acceptable (N = 463)	Optimal (N = 215)	Poor (N = 191)
Sex (female)	135 (66.8%)	193 (67.2%)	241 (52.1%)	119 (55.3%)	91 (47.6%)
Age (mean ± SD)	52.6 (11.2)	49.3 (10.3)	66.7 (9.63)	67.5 (10.1)	61.8 (11.3)
Number of years with diabetes (mean ± SD)	39.8 (13.7)	36.8 (10.9)	17.1 (8.50)	11.5 (7.68)	21.4 (8.20)
Missing	1 (0.5%)	1 (0.3%)	26 (5.6%)	28 (13.0%)	8 (4.2%)
Smoking (yes %)	15 (7.4%)	51 (17.8%)	62 (13.4%)	21 (9.8%)	30 (15.7%)
Missing	23 (11.4%)	39 (13.6%)	74 (16.0%)	46 (21.4%)	41 (21.5%)
Mean arterial pressure (mean ± SD)	90.4 (5.20)	90.8 (5.49)	95.3 (5.67)	96.1 (6.56)	95.4 (6.70)
Missing	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)
BMI mean (SD)	26.2 (3.87)	26.7 (4.07)	30.0 (4.87)	29.8 (5.17)	30.9 (4.80)
Missing	0 (0%)	1 (0.3%)	4 (0.9%)	5 (2.3%)	2 (1.0%)
Physical activity (median range)	3.50 [1.00, 5.00]	3.26 [1.00, 5.00]	3.54 [1.00, 5.00]	3.75 [1.00, 5.00]	3.10 [1.00, 5.00]
Missing	3 (1.5%)	3 (1.0%)	3 (0.6%)	6 (2.8%)	3 (1.6%)
RR preoperatively	82 (40.6%)	112 (39.0%)	153 (33.0%)	73 (34.0%)	50 (26.2%)
RR 3 mo	56 (27.7%)	70 (24.4%)	123 (26.6%)	50 (23.3%)	36 (18.8%)
RR 12 mo	48 (23.8%)	55 (19.2%)	108 (23.3%)	43 (20.0%)	31 (16.2%)
Nonresponders[b]	81 (40.1%)	130 (45.3%)	223 (48.2%)	106 (49.3%)	113 (59.2%)

Note. T1DM = type 1 diabetes mellitus; T2DM = type 2 diabetes mellitus; HbA1c = hemoglobin A1c; SD = standard deviation; BMI = body mass index; RR = response rate.
[a]Optimal group excluded due to the few individuals (n = 7).
[b]Nonresponders did not answer a single questionnaire.

statistical analyses were conducted by a professional medical statistician in R, version 4.3.3.

Results

Baseline Data

In total, 496 individuals with T1DM and 869 with T2DM underwent OTFR during the inclusion period. Of these, 710 individuals (52%) answered at least 1 questionnaire and were included in the analyses. There were only 7 individuals with T1DM who had an optimal HbA1c; thus, they were excluded from the analysis. All baseline characteristics in the respective HbA1c group are presented in Table 1.

Patient-Reported Outcome

There was no difference in QuickDASH nor HQ-8 *between* the HbA1c groups, neither at 3 months nor at 12 months and neither for T1DM nor T2DM (Tables 2 and 3).

Sensitivity Analysis

In the sensitivity analysis, using the HbA1c level measured the *same year* as surgery, there were still no difference in PRO between the HbA1c groups in regression models, neither among T1DM nor T2DM, neither at 3 months nor 12 months after surgery (Tables 4 and 5). As there were only 15 individuals with T1DM who had an optimal HbA1c the same year as surgery, they were excluded from the analysis.

Nonresponder Analysis

The nonresponder analysis is presented in Supplementary Table S1. A slightly shorter diabetes duration ($P = .01$) and more individuals who were smokers ($P = .018$) were noted in the nonresponder group, but no other difference between the responders and the nonresponders.

Discussion

The main findings from this study confirm similar postoperative outcome 12 months after surgery in individuals with T1DM and T2DM regardless of glycemic control. All HbA1c groups improved their HQ-8 and QuickDASH scores 12 months after surgery, and furthermore, there was no difference in the PRO neither at 3 months nor at 12 months after surgery between the different groups of glycemic control, indicating good results *regardless* of their long-term HbA1c. Finally, the results from the sensitivity analysis,

Table 2. Estimated Means From Linear Mixed Models for Type 1 Diabetes Mellitus (T1DM) Using *Mean HbA1c During All Registered Years*.

		Acceptable HbA1c (reference)	Poor HbA1c	
Type 1 diabetes mellitus[a]		Estimated mean (95% CI)	Estimated mean (95% CI)	*P* value[b]
Pre-op	QuickDASH	43.3 [38.48 to 48.11]	44.26 [40.18 to 48.35]	1.000
	HQ-1	66.89 [60.08 to 73.69]	70.94 [65.12 to 76.76]	1.000
	HQ-2	50.53 [44.35 to 56.71]	53.14 [47.87 to 58.42]	1.000
	HQ-4	70.37 [62.91 to 77.82]	65.65 [59.21 to 72.09]	1.000
3 mo	QuickDASH	22.58 [17.18 to 27.97]	25.54 [20.98 to 30.09]	1.000
	HQ-1	32.03 [24.23 to 39.83]	39.53 [32.89 to 46.17]	1.000
	HQ-2	25.04 [17.97 to 32.12]	29.38 [23.35 to 35.4]	1.000
	HQ-4	40.85 [32.27 to 49.42]	42.08 [34.79 to 49.38]	1.000
	HQ-9	28.97 [18.97 to 38.98]	39.39 [31.11 to 47.68]	0.714
12 mo	QuickDASH	19.54 [13.7 to 25.38]	20.43 [15.21 to 25.65]	1.000
	HQ-1	22.17 [13.66 to 30.69]	24.43 [16.77 to 32.09]	1.000
	HQ-2	17.71 [9.98 to 25.44]	18.71 [11.7 to 25.71]	1.000
	HQ-4	25.61 [16.25 to 34.97]	26.82 [18.38 to 35.26]	1.000
	HQ-9	21.66 [11.05 to 32.27]	27.96 [18.7 to 37.22]	1.000

Note. Estimated means are presented with 95% confidence intervals, preoperative, at 3 months, and 12 months, respectively, and adjusted for sex, age, smoking, BMI, number of years with diabetes, mean arterial pressure, and physical activity. HbA1c cut-off lines "acceptable control" 48.1 to 64 mmol/mol, and "poor control" >64 mmol/mol. HbA1c = hemoglobin A1c; CI = confidence interval; QuickDASH = Quick Disabilities of the Arm, Shoulder, and Hand; HQ = HAKIR Questionnaire; BMI = body mass index.
[a]Optimal group (HbA1c ≤ 48 mmol/mol) excluded due to the few individuals (n = 7).
[b]*P* value for comparison with "acceptable" group as reference.

Table 3. Estimated Means From Linear Mixed Models for Type 2 Diabetes Mellitus (T2DM) Using *Mean HbA1c During All Registered Years*.

		Acceptable HbA1c (reference)	Optimal HbA1c		Poor HbA1c	
Type 2 diabetes mellitus		Estimated mean (95% CI)	Estimated mean (95% CI)	*P* value[a]	Estimated mean (95% CI)	*P* value[a]
Pre-op	QuickDASH	40.7 [36.91 to 44.65]	44.6 [38.6 to 50.65]	1	45.6 [39.08 to 52.3]	1
	HQ-1	58.7 [53.88 to 63.53]	62.1 [54.61 to 69.67]	1	64.2 [56.03 to 72.46]	1
	HQ-2	45.3 [40.95 to 49.81]	44.6 [37.69 to 51.63]	1	51.4 [43.79 to 59.04]	1
	HQ-4	51.2 [45.93 to 56.56]	61.5 [53.38 to 69.79]	0.6	61.5 [52.56 to 70.51]	1
3 mo	QuickDASH	22.5 [18.32 to 26.69]	19.0 [11.96 to 26.19]	1	26.8 [18.81 to 34.83]	1
	HQ-1	29.5 [24.33 to 34.8]	21.8 [12.78 to 30.97]	1	27.8 [17.22 to 38.53]	1
	HQ-2	21.0 [16.19 to 25.91]	12.2 [3.73 to 20.67]	1	18.6 [8.64 to 28.55]	1
	HQ-4	30.0 [24.37 to 35.79]	31.8 [22.05 to 41.69]	1	30.6 [19.01 to 42.31]	1
	HQ-9	27.8 [21.72 to 34.01]	20.5 [10.18 to 30.94]	1	29.8 [17.47 to 42.27]	1
12 mo	QuickDASH	16.3 [11.92 to 20.81]	19.6 [12.24 to 27.15]	1	25.3 [17.15 to 33.44]	1
	HQ-1	15.8 [10.3 to 21.43]	15.7 [6.37 to 25.06]	1	18.3 [7.67 to 28.95]	1
	HQ-2	9.1 [3.9 to 14.31]	10.5 [1.85 to 19.26]	1	11.6 [1.91 to 21.4]	1
	HQ-4	13.0 [6.95 to 19.08]	17.9 [7.54 to 28.36]	1	13.9 [2.29 to 25.66]	1
	HQ-9	13.4 [6.96 to 20.03]	17.7 [6.73 to 28.72]	1	17.6 [5.21 to 30.01]	1

Note. Estimated means are presented with 95% confidence intervals, preoperative, at 3 months, and 12 months, respectively, and adjusted for sex, age, smoking, BMI, number of years with diabetes, mean arterial pressure, and physical activity. HbA1c = hemoglobin A1c; CI = confidence interval; QuickDASH = Quick Disabilities of the Arm, Shoulder, and Hand; HQ = HAKIR Questionnaire; BMI = body mass index.
[a]*P* value for comparison with "acceptable" group as reference.

Table 4. Estimated Means From Linear Mixed Models for Type 1 Diabetes Mellitus (T1DM) Using *HbA1c From the Same Year as Surgery*.

		Acceptable HbA1c (reference)	Poor HbA1c	
Type 1 diabetes mellitus[a]		Estimated mean (95% CI)	Estimated mean (95% CI)	*P* value[b]
Pre-op	QuickDASH	45.24 [40.07 to 50.4]	45.01 [40.68 to 49.33]	1.000
	HQ-1	69.56 [62.04 to 77.08]	73.27 [66.96 to 79.58]	1.000
	HQ-2	50.15 [43.3 to 57]	56.3 [50.52 to 62.07]	1.000
	HQ-4	70.61 [62.54 to 78.68]	68.07 [61.22 to 74.92]	1.000
3 mo	QuickDASH	23.98 [18.21 to 29.75]	26.93 [22.19 to 31.66]	1.000
	HQ-1	33.46 [25 to 41.93]	43.16 [36.14 to 50.19]	0.728
	HQ-2	28.26 [20.51 to 36]	29.75 [23.31 to 36.19]	1.000
	HQ-4	40.12 [30.94 to 49.29]	45.14 [37.51 to 52.78]	1.000
	HQ-9	33.59 [23.3 to 43.88]	41.65 [33.11 to 50.2]	1.000
12 mo	QuickDASH	20.76 [14.24 to 27.28]	20.91 [15.74 to 26.07]	1.000
	HQ-1	26.32 [16.62 to 36.01]	24.0 [16.32 to 31.69]	1.000
	HQ-2	21.37 [12.49 to 30.25]	18.5 [11.46 to 25.54]	1.000
	HQ-4	29.31 [18.78 to 39.85]	26.03 [17.67 to 34.39]	1.000
	HQ-9	30.7 [19.26 to 42.14]	26.78 [17.59 to 35.97]	1.000

Note. Estimated means are presented with 95% confidence intervals, preoperative, at 3 months, and 12 months, respectively, and adjusted for sex, age, smoking, BMI, number of years with diabetes, mean arterial pressure, and physical activity. HbA1c = hemoglobin A1c; CI = confidence interval; QuickDASH = Quick Disabilities of the Arm, Shoulder, and Hand; HQ = HAKIR Questionnaire; BMI = body mass index.
[a]Optimal group (≤48 mmol/mol) excluded due to the few individuals (n = 15).
[b]*P* value for comparison with "acceptable" group as reference. The cut-off lines for HbA1c: "acceptable control" 48.1 to 64 mmol/mol and poor control >64 mmol/mol.

Table 5. Estimated Means From Linear Mixed Models for Type 2 Diabetes Mellitus (T2DM) Using *HbA1c From the Same Year as Surgery*.

		Acceptable HbA1c (reference)	Optimal HbA1c		Poor HbA1c	
Type 2 diabetes mellitus		Estimated mean (95% CI)	Estimated mean (95% CI)	*P* value[a]	Estimated mean (95% CI)	*P* value[a]
Pre-op	QuickDASH	41.4 [36.61 to 46.29]	45.1 [39.45 to 50.8]	1	42.4 [35.89 to 48.93]	1
	HQ-1	58.2 [51.99 to 64.44]	62.2 [54.97 to 69.43]	1	62.5 [54.29 to 70.8]	1
	HQ-2	44.4 [38.79 to 50.14]	47.2 [40.54 to 53.9]	1	48.9 [41.33 to 56.6]	1
	HQ-4	51.7 [44.84 to 58.69]	56.6 [48.58 to 64.73]	1	56.5 [47.08 to 65.95]	1
3 mo	QuickDASH	23.7 [18.59 to 28.81]	22.3 [15.76 to 28.85]	1	28.9 [20.41 to 37.47]	1
	HQ-1	31.6 [25.13 to 38.24]	23.8 [15.29 to 32.38]	1	31.0 [19.36 to 42.83]	1
	HQ-2	22.7 [16.64 to 28.81]	15.0 [7.1 to 22.97]	1	19.3 [8.39 to 30.28]	1
	HQ-4	31.3 [24.04 to 38.64]	32.6 [23.23 to 42.11]	1	28.5 [15.5 to 41.58]	1
	HQ-9	31.0 [23.14 to 38.94]	24.3 [14.2 to 34.41]	1	30.3 [16.62 to 44.1]	1
12 mo	QuickDASH	16.6 [11.44 to 21.83]	18.4 [11.37 to 25.58]	1	19.3 [11.35 to 27.38]	1
	HQ-1	15.1 [8.55 to 21.83]	15.2 [6.13 to 24.4]	1	15.7 [5.31 to 26.17]	1
	HQ-2	8.45 [2.17 to 14.72]	10.1 [1.65 to 18.64]	1	8.86 [−0.85 to 18.57]	1
	HQ-4	14.0 [6.48 to 21.51]	16.0 [5.84 to 26.31]	1	13.1 [1.51 to 24.87]	1
	HQ-9	17.7 [9.56 to 25.85]	15.6 [4.52 to 26.84]	1	10.7 [−1.9 to 23.44]	1

Note. Estimated means are presented with 95% confidence intervals, preoperative, at 3 months, and 12 months, respectively, and adjusted for sex, age, smoking, BMI, number of years with diabetes, mean arterial pressure and physical activity. HbA1c = hemoglobin A1c; CI = confidence interval; QuickDASH = Quick Disabilities of the Arm, Shoulder, and Hand; HQ = HAKIR Questionnaire; BMI = body mass index.
[a]*P* value for comparison with "acceptable" group as reference. The cut-off lines for "optimal control" HbA1c ≤48 mmol/mol, "acceptable control" 48.1 to 64 mmol/mol, and "poor control" >64 mmol/mol.

analyzing HbA1c levels the same year as surgery, indicate that OTFR generally has a successful outcome regardless of glycemic control adjacent to the time of surgery. Thus, for *long-term* outcome, preoperative HbA1c testing does not seem to be necessary among individuals with DM.

To the best of our knowledge, this is the first major study analyzing PRO after OTFR in relation to HbA1c levels. There are, however, previous studies that corroborate our findings in individuals with DM. Stirling et al[7] reported high patient satisfaction (90% in nondiabetes, 96% in diabetes) and similar functional improvement after OTFR with a median follow-up of 14 months. These findings were supported by Köroğlu et al[24] who also reported similar outcome after OTFR among individuals with DM compared with individuals without DM. What this study adds, however, is the detailed data on HbA1c levels in relation to outcome after OTFR, confirming equal outcome across all HbA1c groups, and also the stratified analyses for T1DM and T2DM.

Finally, our study showed no difference in long-term outcome after OTFR, regardless of HbA1c levels. However, for short-term outcome, such as postoperative complications like SSI, a recent meta-analysis, including 213 071 patients with trigger finger, indeed reported higher risk of SSI among patients with DM compared with individuals without DM.[25] Furthermore, although Werner et al[26] reported a low complication rate (0.5%-0.6%) after OTFR, they still noted DM as a risk factor for short-term complications, and likewise, Federer et al[14] reported a higher complication rate after OTFR among individuals with DM. Schweitzer et al[27] reported higher complication rates in elective hand surgery among individuals with insulin-dependent DM, and Cox et al[13] reported higher complication rate among individuals with HbA1c <10% (86 mmol/mol) but not between 6.5% and 10% (48-86 mmol/mol). Taking this together, the absolute risk of SSI and other *short-term complications* are low after OTFR but the risk might still be higher in individuals with DM. Nevertheless, further evidence is needed, particularly in relation to glycemic control and HbA1c levels. What this study adds is data on long-term outcome, indicating improvement of both QuickDASH and HQ-8 12 months after surgery and similar results *regardless* of HbA1c-group.

Strengths and Limitations

One limitation of this study is the response rate in HAKIR, a challenge faced by many large web surveys. Approximately 52% of the individuals included in this study answered at least 1 questionnaire. In recent years, successful measures have been implemented to HAKIR to improve response rates, such as simplifying login procedures and enabling mobile phone access for questionnaire completion. When the response rate is low, the generalizability and external validity of the study can be questioned.[28,29] On this note, a UK study at a single hand surgical center examined the PROs among nonresponders over a 6-year period. At 12 months postoperatively, they found no significant difference in predicted QuickDASH scores between responders and nonresponders.[30] Similar results have been found observed among nonresponders following lumbar spine surgery,[31] knee and hip surgery,[32] as well as shoulder surgery.[33] A nonresponder analysis in HAKIR is currently being conducted. Thus, despite a relatively low response rate in our study, the findings remain relevant among individuals with DM and align with our clinical experience.

There are several noteworthy strengths to the present study, the first being the quality of the registers used for the data set. Both HAKIR and NDR have high coverage rate. Swedish National Quality Registry for Hand Surgery includes approximately 90% of all surgeries performed at the 7 university hospitals in Sweden and also several private hand surgical clinics throughout Sweden.[16] National Diabetes Register includes approximately 85% to 90% of all individuals with DM in Sweden, and an automated reporting system integrates data from both primary and secondary care, ensuring a high level of data completeness. This enables inclusion of large study populations and thus increases the generalizability of the findings of the study. The large study population also allows for stratification for T1DM and T2DM, diseases that have distinct difference in pathophysiology which, potentially, could alter the findings if not properly adjusted for. Finally, adjustment for confounding factors, such as BMI, physical activity, and smoking, is a notable strength of the study. However, residual confounding may still remain due to metabolic or environmental factors that we were not able to adjust for. Examples such as genetic factors, previous hand trauma, alcohol consumptions, and medications are factors that could potentially affect our results, and the findings presented in this study should be interpreted with this in mind.

Conclusions

Poor glycemic control was not associated with worse PRO 12 months after OTFR in individuals with T1DM or T2DM. Thus, for long-term outcome, preoperative HbA1c testing does not seem to be necessary.

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Author Contributions

MR and MA conceived the idea for the study. MA and KE-O were responsible for the registry data. MR, MA, and KE-O analyzed

and interpreted the data. MR led the writing, and all authors contributed to the interpretation and the writing and approved the final version of the manuscript.

Ethical Approval

The study was approved beforehand by the regional ethics committee (DNR 2017/2023-31, 2019-00880, 2021-00902).

Statement of Human and Animal Rights

The study was made in accordance with the Declaration of Helsinki.

Statement of Informed Consent

Participation in both HAKIR and NDR is voluntary, and individuals can choose to opt out from the study at any time.

Declaration of Conflicting Interests

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