Scandinavian Cardiovascular Journal

ISSN: 1401-7431 (Print) 1651-2006 (Online) Journal homepage: www.tandfonline.com/journals/icdv20

Risk factors for leg wound infection after conventional and no-touch vein harvesting: insights from a multicentre randomised trial

Hanna Unosson , Magnus Dalén , Karin Jensevik Eriksson , Henrik Hultkvist , Stefan James , Anders Jeppsson , Hans Henrik Kimose , Ivy Susanne Modrau , Sigurdur Ragnarsson , Ulrik Sartipy , Stefan Thelin , Per Vikholm & Örjan Friberg

To cite this article: Hanna Unosson , Magnus Dalén , Karin Jensevik Eriksson , Henrik Hultkvist , Stefan James , Anders Jeppsson , Hans Henrik Kimose , Ivy Susanne Modrau , Sigurdur Ragnarsson , Ulrik Sartipy , Stefan Thelin , Per Vikholm & Örjan Friberg (2026) Risk factors for leg wound infection after conventional and no-touch vein harvesting: insights from a multicentre randomised trial, Scandinavian Cardiovascular Journal, 60:1, 2730710, DOI: 10.1080/14017431.2026.2730710

To link to this article: https://doi.org/10.1080/14017431.2026.2730710

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

View supplementary material

Published online: 10 Sep 2026.

Submit your article to this journal

Article views: 186

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=icdv20

SCANDINAVIAN CARDIOVASCULAR JOURNAL
2026, VOL. 60, NO. 1, 2730710
https://doi.org/10.1080/14017431.2026.2730710

Taylor & Francis
by informa

RESEARCH ARTICLE

OPEN ACCESS Check for updates

Risk factors for leg wound infection after conventional and no-touch vein harvesting: insights from a multicentre randomised trial

Hanna Unosson[a,b], Magnus Dalén[c,d], Karin Jensevik Eriksson[e], Henrik Hultkvist[f,g], Stefan James[e,h], Anders Jeppsson[i,j], Hans Henrik Kimose[k,l], Ivy Susanne Modrau[k,l], Sigurdur Ragnarsson[m,n], Ulrik Sartipy[c,d], Stefan Thelin[o,p], Per Vikholm[o,p] and Örjan Friberg[a,q]

[a]Department of Cardiothoracic and Vascular Surgery, Örebro University Hospital, Örebro, Sweden; [b]Faculty of Medicine and Health, School of Health Sciences, Örebro University, Örebro, Sweden; [c]Department of Cardiothoracic Surgery, Karolinska University Hospital, Stockholm, Sweden; [d]Department of Molecular Medicine and Surgery, Karolinska Institutet, Stockholm, Sweden; [e]Uppsala Clinical Research Center, Uppsala University, Uppsala, Sweden; [f]Department of Cardiothoracic and Vascular Surgery, Linköping University Hospital, Linköping, Sweden; [g]Department of Health, Medicine and Caring Sciences, Unit of Cardiovascular Medicine, Linköping University, Linköping, Sweden; [h]Department of Medical Sciences, Uppsala University, Cardiology, Sweden; [i]Department of Cardiothoracic Surgery, Sahlgrenska University Hospital, Gothenburg, Sweden; [j]Department of Molecular and Clinical Medicine, Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; [k]Department of Cardiothoracic and Vascular Surgery, Aarhus University Hospital, Aarhus, Denmark; [l]Department of Clinical Medicine, Aarhus University, Aarhus, Denmark; [m]Department of Cardiothoracic and Vascular Surgery, Skåne University Hospital, Lund, Sweden; [n]Department of Clinical Sciences, Lund University, Lund, Sweden; [o]Department of Thoracic Surgery, Uppsala University Hospital, Uppsala, Sweden; [p]Department of Surgical Sciences, Thoracic Surgery, Uppsala University, Sweden; [q]Faculty of Medicine and Health, School of Medical Sciences, Örebro University, Örebro, Sweden

ABSTRACT

Objectives: To identify patient- and procedure-related risk factors for surgical site infection following open saphenous vein graft harvesting for coronary artery bypass grafting, using either conventional or no-touch techniques. *Design:* We conducted a sub-study of the SWEDEGRAFT multicentre randomised trial (ClinicalTrials.gov: ID NCT03501303) comparing conventional and no-touch saphenous vein harvesting for coronary artery bypass grafting. The outcome was leg wound infection, defined as a wound healing disturbance requiring antibiotic treatment. Univariable and multivariable logistic regression assessed associations between prespecified covariates and infection. *Results:* Of 900 patients, 860 were followed up at 3 months. The proportion of patients with leg wound infections was 12.0%. In the adjusted analysis, covariates independently associated with leg wound infection were the use of the no-touch harvesting technique (adjusted OR 2.78; 95% CI 1.75–4.44) and left ventricular ejection fraction <30% (adjusted OR 3.66; 95% CI 1.29–10.38). Female sex showed a numerically higher risk that did not reach statistical significance (adjusted OR 1.76; 95% CI 0.98–3.16). No significant statistical interaction was found between sex or diabetes mellitus and vein harvest technique regarding the risk of infection. There were significant differences in leg wound infections among the participating centres. *Conclusions:* The no-touch vein harvesting technique and poor left ventricular systolic function were independently associated with infectious complications at the vein harvest site after coronary artery bypass grafting. The findings also suggest that female patients may be at higher risk, although the estimate was imprecise. These results could be helpful, should a selective use of the no-touch technique be desired.

Clinical Registration Number:
ClinicalTrials.gov: ID NCT03501303

ARTICLE HISTORY
Received 25 November 2025
Revised 19 August 2026
Accepted 3 September 2026

KEYWORDS
Coronary artery bypass grafting; surgical site infection; leg wound infection; vein graft; no-touch technique

Introduction

Coronary artery bypass grafting (CABG) is the recommended treatment for patients with advanced multi-vessel coronary artery disease [1]. Although the use of the left internal mammary artery is well-established, and the use of multiple arterial grafts is recommended, the saphenous vein graft (SVG) is still the most commonly used second conduit [2,3]. However, suboptimal wound healing and infection at

CONTACT Örjan Friberg orjan.friberg@regionorebrolan.se Dept of Cardiothoracic and Vascular Surgery, Örebro University Hospital, 701 85 Örebro, Sweden
Supplemental data for this article can be accessed online at https://doi.org/10.1080/14017431.2026.2730710.

Meeting presentation
The manuscript was presented at the Annual Meeting of the Swedish Association for Cardiothoracic Surgery in Örebro, Sweden, November 7, 2025.

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

the SVG harvest site are common concerns. Endoscopic vein harvesting is effective in reducing the occurrence of surgical site infection (SSI) when compared with open harvesting, but this technique has not gained general acceptance, due to additional cost, need for extra equipment and potential concerns regarding the patency of the SVG [4].

After open vein harvesting, the reported rate of SSI requiring antibiotic treatment ranges from 2.4% to 23.3% [5–8]. Commonly reported patient-specific risk factors for SSI after general surgery include obesity, diabetes mellitus (DM), age, smoking, malnutrition and male sex [9,10]. In cardiovascular surgery, female sex has been associated with an increased risk of leg wound infections [6,8]. However, the number of studies on SSI risk factors after vein graft harvesting is limited.

In a recent multicentre randomised study (the SWEDEGRAFT study), we compared SVG patency in veins harvested with a pedicle of surrounding tissue – referred to as the no-touch technique – versus a conventional, skeletonised technique [11]. The no-touch technique had no significant overall effect on graft patency, the primary endpoint. However, subgroup analyses showed that in patients without DM, there was significantly better graft patency with the no-touch technique than with the conventional technique.

An important drawback of the no-touch technique was an increased risk of leg wound complications, including SSI requiring antibiotic treatment. Further analyses of these findings are warranted to identify patients at the highest risk of postoperative leg wound complications. Analysis of the potential interaction between DM and the no-touch technique in terms of SSI is of special interest because the technique may offer improved graft patency in patients without DM [11].

The aim of the present sub-study of the SWEDEGRAFT study was to identify patient- and procedure-related risk factors for SSI after vein graft harvesting, in the context of the findings from the original study.

Materials and methods

The design and main results of the SWEDEGRAFT study have been published previously [11,12]. In brief, SWEDEGRAFT was a multicentre, prospective, randomised, register-based trial with the primary aim of evaluating graft patency after CABG surgery in vein grafts harvested and implanted using either no-touch or conventional techniques. Following written informed consent, the participants were recruited from all eight cardiothoracic centres in Sweden and one site in Denmark.

The SWEDEGRAFT study was approved by the Research Ethics Committee of Uppsala (2016/363) and the Central Denmark Regional Committee on Health Research Ethics, and was registered at ClinicalTrials.gov (ID: NCT03501303).

Definition and follow-up of leg wound complications

Postoperative leg wound complications were assessed *via* structured telephone interviews conducted by trained research nurses at each centre at two time points: 3 months (10–14 weeks) and 2 years after surgery. At the 3-month follow-up, patients were asked whether they had experienced postoperative leg wound complications, had required contact with healthcare personnel due to a wound problem, had received wound dressing by a nurse, had their wound assessed by a physician, required antibiotic treatment for leg wound complications or required surgical intervention for their wound. At the 2-year follow-up, we asked whether the patients had any remaining symptoms and, if so, whether the leg was swollen, they had any problems with sensation, the skin was not healed, or pain from the wound remained.

The primary outcome of this sub-study was SSI at the vein harvest site, which was defined as antibiotic treatment for a leg wound complication. Since antibiotic treatment is always prescribed by a physician, this definition closely adheres to the US Centers for Disease Control and Prevention (CDC) classification of SSI, where the final criterion is "definition of SSI by a surgeon or attending physician" [13].

Statistical analysis

Descriptive statistics were presented as numbers and percentages for categorical variables and means and standard deviations for continuous variables. Unadjusted and adjusted logistic regression analyses were used to examine associations between covariates and SSI. Missing data were rare and all analyses were complete-case. Candidate covariates were identified a priori based on clinical reasoning and subject-matter knowledge as established or plausible risk factors for SSI: vein harvesting technique, age, sex, body mass index (BMI), diabetes mellitus, left ventricular function, chronic pulmonary disease, renal function, preoperative vein mapping, and number of suture layers.

Differences in SSI between centres were initially assessed using unadjusted logistic regression, with the largest centre as the reference category. The primary multivariable analysis was performed using mixed-effects logistic regression, with the candidate covariates as fixed effects and centre included as a random intercept to account for clustering of patients within centres. BMI was modelled as a continuous variable using restricted cubic splines.

Sensitivity analyses included (i) a reduced multivariable model retaining only covariates with the strongest clinical justification, owing to concerns about the events-per-variable ratio given the 103 observed SSI events, and (ii) a model in which centre was included as a fixed rather than a random effect. Results from the adjusted analyses were reported as adjusted odds ratios (ORs) with 95% confidence intervals (CIs).

To investigate whether the association between harvesting technique and SSI differed according to sex or diabetes mellitus, interaction terms between harvesting technique and sex and between harvesting technique and diabetes mellitus were tested. The absolute differences between female and male patients in complications at the saphenous vein harvest site at 3 months and 2 years were also calculated with 95% CIs. All statistical tests were two-sided, with a significance level of 0.05.

Statistical analyses were performed using IBM SPSS Statistics version 27 (IBM Corp., Armonk, NY, USA), SAS version 9.4, and R version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria).

Results

In total, 900 patients from the SWEDEGRAFT trial underwent CABG surgery between April 2018 and June 2020. Of these, 860 were followed up at 3 months, representing 95.7% and 95.4% of the population in the no-touch and conventional groups, respectively. Information on antibiotic treatment for SSI in the leg wound was available for 856 patients (107 women [99.1% of all female participants] and 749 men [94.6% of all male participants]). The baseline characteristics of the study population are presented in Table 1.

Factors associated with leg wound SSI

The total proportion of patients with SSI was 12.0% (103/856). Among patients with an SSI, 22.0% (23/103) underwent surgical revision of the leg wound. Two additional patients had surgical revision of the wound but received no antibiotic treatment and so were not classified as having SSI in the analyses.

Compared with male patients, female patients had a higher proportion of SSI in the leg wound at the 3-month follow-up, with 18.7% (20/107) of women vs. 11.1% (83/749) of men (Table 2). In the adjusted analysis, covariates independently associated with SSI were no-touch harvesting technique (adjusted OR 2.78, 95% CI 1.75–4.44) and left ventricular ejection fraction <30% (adjusted OR 3.66, 95% CI 1.29–10.38). Females had significantly more SSI in the unadjusted analyses (OR 1.85, 95% CI 1.08–3.16; Figure S1), and female sex almost reached significance in the adjusted analyses (adjusted OR 1.76, 95% CI 0.98–3.16, $p = 0.057$; Figure 1). Additionally, differences existed in the proportion of SSI among the participating centres (Figure S1). This difference was significant in the multivariable model (joint $p = 0.007$). The lowest incidence of SSI in a single centre was 4.9%, and the highest was 17.4%. Preoperative mapping of the saphenous vein with ultrasound did not reduce the incidence of SSI (Figure 1). The number of suture layers used for closing the leg wound was the only factor related to surgical technique for which data were available, but it was not associated with the risk of SSI (Figure 1). The sensitivity analyses with alternative multivariable models showed very similar results, indicating a stable model (Tables S1 and S2).

A trend existed towards more SSI in patients with DM, but this was not statistically significant (adjusted OR 1.41, 95% CI 0.87–2.30). We found no evidence of a differential effect of the no-touch harvesting technique on the risk of SSI in men versus women or patients with or without diabetes (P for interaction = 0.58 and 0.75, respectively; Figure 2).

At the 2-year follow-up, a total of 742 valid responses were received. Of these, 37.7% had any residual symptoms, with similar incidence among men and women (38.2% in women vs. 37.7% in men). Some impairment of skin sensation at the harvest site was the most common remaining symptom in both groups.

Discussion

In this study, the no-touch vein harvesting technique and impaired left ventricular ejection fraction were identified as significant independent risk factors for SSI. Female sex showed a numerically higher risk that did not reach statistical significance. The higher proportion of SSI associated with the no-touch technique was not limited to specific risk populations, such as

Table 1. Baseline data in patients with and without postoperative leg wound SSI.

	N		SSI *N* = 103	Non-SSI *N* = 753	All *N* = 856
Age at index operation	856	Years	66.6 (7.56)	67.1 (7.67)	67.0 (7.65)
Sex	856	Female	20/103 (19.4)	87/753 (11.6)	107/856 (12.5)
		Male	83/103 (80.6)	666/753 (88.4)	749/856 (87.5)
Weight	855	kg	87.5 (17.30)	85.8 (13.96)	86.0 (14.40)
Height	855	cm	175.5 (8.51)	174.9 (7.74)	175.0 (7.83)
BMI	855	kg/m^2	28.3 (4.96)	28.0 (3.82)	28.0 (3.97)
		BMI < 18.5	1 (1.0)	1 (0.1)	2 (0.2)
		BMI 18.5–25	27 (26.2)	164 (21.8)	191 (22.3)
		BMI 25–30	41 (39.8)	377 (50.1)	418 (48.9)
		BMI ≥ 30	34 (33.0)	210 (27.9)	244 (28.5)
eGFR	856	ml/min/1.73 m^2	88.1 (13.89)	86.3 (15.15)	86.5 (15.01)
On dialysis	852		1/103 (1.0)	2/749 (0.3)	3/852 (0.4)
Diabetes mellitus	855		35/103 (34.0)	197/752 (26.2)	232/855 (27.1)
Insulin treatment	851		8/103 (7.8)	62/748 (8.3)	70/851 (8.2)
Diabetes treatment Peroral	855		28/103 (27.2)	154/752 (20.5)	182/855 (21.3)
Hypertension	809		74/97 (76.3)	546/712 (76.7)	620/809 (76.6)
Previous stroke	856		7/103 (6.8)	37/753 (4.9)	44/856 (5.1)
Prior PCI	856		17/103 (16.5)	154/753 (20.5)	171/856 (20.0)
Chronic lung disease	856	No	95/103 (92.2)	689/753 (91.5)	784/856 (91.6)
		Yes	8/103 (7.8)	63/753 (8.4)	71/856 (8.3)
		Unknown	0/103 (0.0)	1/753 (0.1)	1/856 (0.1)
Systolic left ventricular function	856	Good (LV-EF > 50%)	76/103 (73.8)	606/753 (80.5)	682/856 (79.7)
		Moderate (LV-EF 31%–50%)	20/103 (19.4)	133/753 (17.7)	153/856 (17.9)
		Poor/Very poor (LV-EF < 30%)	7/103 (6.8)	14/753 (1.9)	21/856 (2.5)
Urgency	856	Elective	58/103 (56.3)	410/753 (54.4)	468/856 (54.7)
		Urgent	45/103 (43.7)	343/753 (45.6)	388/856 (45.3)
Pulmonary hypertension	856	Moderate (SPAP 31–55 mmHg)	1/103 (1.0)	16/753 (2.1)	17/856 (2.0)
		No (SPAP < 30 mmHg)	101/103 (98.1)	729/753 (96.8)	830/856 (97.0)
		Unknown	1/103 (1.0)	8/753 (1.1)	9/856 (1.1)
Extracardiac arteriopathy	856		5/103 (4.9)	32/753 (4.2)	37/856 (4.3)
CCS class IV angina	855		5/103 (4.9)	59/752 (7.8)	64/855 (7.5)
NYHA class	856	I	22/103 (21.4)	190/753 (25.2)	212/856 (24.8)
		II	46/103 (44.7)	302/753 (40.1)	348/856 (40.7)
		III	22/103 (21.4)	220/753 (29.2)	242/856 (28.3)
		IV	4/103 (3.9)	14/753 (1.9)	18/856 (2.1)
		Unknown	9/103 (8.7)	27/753 (3.6)	36/856 (4.2)
Number of suture layers	854	1	25/103 (24.3)	203/751 (27.0)	228/854 (26.7)
		2	72/103 (69.9)	515/751 (68.6)	587/854 (68.7)
		3	6/103 (5.8)	33/751 (4.4)	39/854 (4.6)
Preoperative vein mapping	854		38/103 (36.9)	228/751 (30.4)	266/854 (31.1)

For continuous variables mean (SD) and for discrete variables n (%). eGFR = estimated glomerular filtration rate defined by the CKD-EPI creatinine Equation (2021). SSI = surgical site infection.

Table 2. Complications at the saphenous vein harvest site in female and male patients at 3-month and 2-year follow-ups.

	N	Female	Male	Difference, % (95% CI)
3 months				
Antibiotic treatment	856	18.7 % 20/107	11.1 % 83/749	7.6 (−0.1 to 15.3)
Surgical intervention	856	6.5 % 7/107	2.4 % 18/749	4.1 (−0.7 to 8.9)
2 years				
Remaining problems, any	742	38.2 % 34/89	37.7 % 246/653	0.5 (−10.2 to 11.3)
Remaining pain	742	13.5 % 12/89	6.6 % 43/653	6.9 (−0.4 to 14.2)
Remaining swelling	742	14.6 % 13/89	12.3 % 80/653	2.4 (−5.4 to 10.1)
Skin sensation disorder	742	28.1 % 25/89	28.0 % 183/653	0.1 (−9.9 to 10.0)
Wound not healed	742	1.1 % 1/89	0.5 % 3/653	0.6 (−1.5 to 2.9)

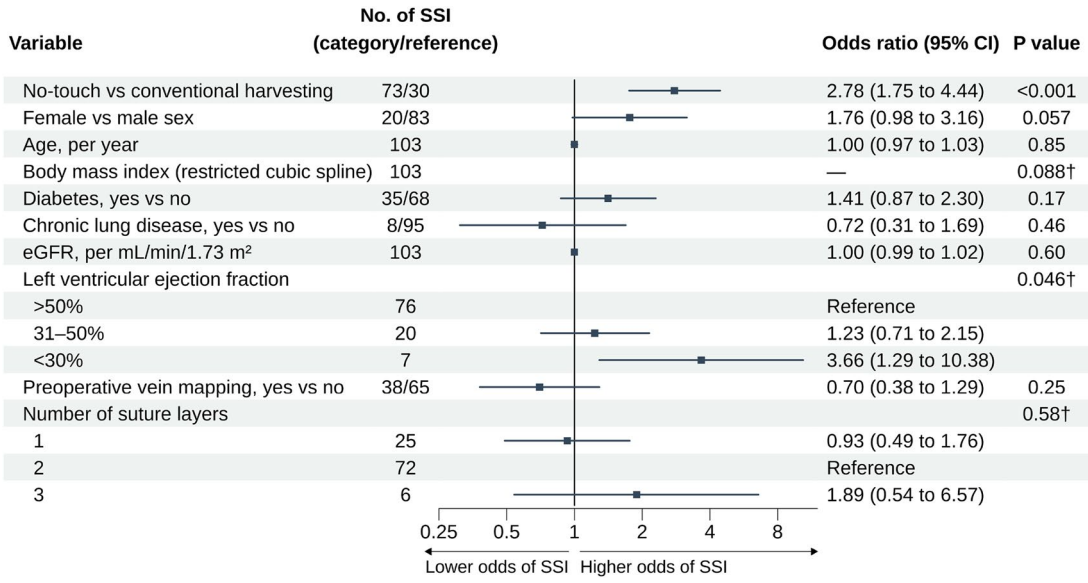

Figure 1. Multivariable model of SSI.
Mixed-effects logistic regression with covariates as fixed effects and a random intercept for center. For binary variables, event counts are shown as category/reference; for multi-category variables, per level. *N* = 852 (4 patients excluded owing to missing data); 103 events. Odds ratios >1 indicate higher odds of SSI.
†*p* value from the joint (Type III) test of all categories or spline terms.
CI, confidence interval; eGFR, estimated glomerular filtration rate; LVEF, left ventricular ejection fraction; OR, odds ratio; SSI, surgical site infection.

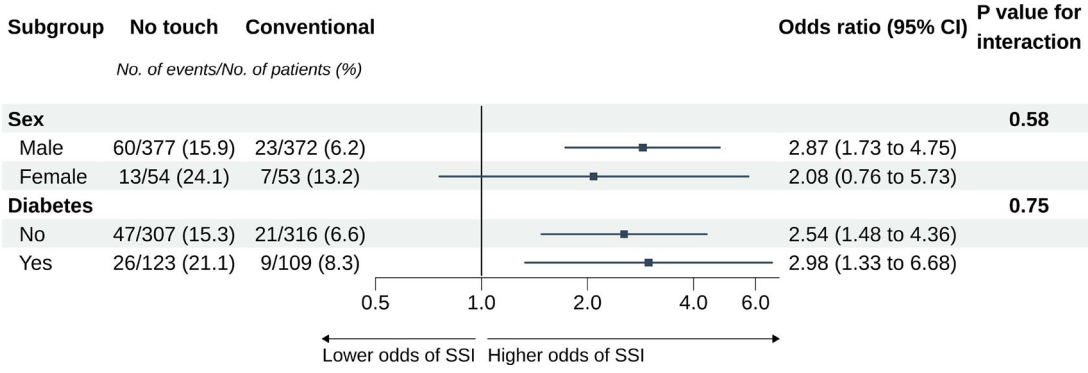

Figure 2. Subgroup analysis of leg wound infection in no-touch and conventional groups according to sex and diabetes status.

women or patients with DM. The increased risk of SSI was of a similar magnitude to that reported in a recent meta-analysis (incidence rate ratio [IRR] 1.73) [14]. The incidence of SSI varied significantly between participating centres.

A few previous studies have examined risk factors for leg wound complications after CABG, with some, but not all, identifying female sex as a risk factor for harvest-site SSI [6,15]. Female sex has also been associated with sternal wound infection after CABG in some studies, although it is not a generally accepted risk factor for SSI after sternotomy [16]. In contrast, after trauma and general surgery, SSI is more likely to affect men than women [9,10,16]. Various factors may contribute to these disparities. Factors such as vessel diameter or skin fragility may differ. Higher body mass index (BMI) is associated with SSI, and sex-specific variability in body-fat distribution has been proposed as another explanation for the higher risk of lower extremity complications in women [17], and abdominal complications in men [9].

Although numerically more SSIs were reported in the group with DM, the difference was not statistically significant. This may reflect limited statistical power or heterogeneity within the diabetic population. Unfortunately, we had no information on glycaemic control (e.g. HbA1c), which would have been informative. No evidence suggested a higher relative risk of SSI with the no-touch technique in patients with DM. Poor left ventricular function, with ejection fraction below 30%, may be associated with lower leg oedema and reduced peripheral circulation as well as

increased usage of vasoconstrictors and poor tissue perfusion, all of which are plausible biological mechanisms for disturbed wound healing and SSI.

The open vein harvesting technique increases the risk of SSI compared with endoscopic harvesting. In a recent survey by our research group, all cardiothoracic centres in Sweden reported using open vein harvesting as their standard technique, either in conventional or no-touch forms [18]. The survey identified some differences between Swedish centres regarding surgical methods, with variations in the number of suture layers used for wound closure, for example. Previous studies have indicated that a single cutaneous layer may be better than multiple layers [19]. However, in this study, the number of suture layers was not associated with SSI risk.

The differences in SSI rates between the participating centres must be interpreted cautiously due to the low numbers of patients at each centre. As previously reported, there was no trend toward a lower risk of SSI at centres with greater experience with the no-touch technique [11].

A previous randomised single-centre study reported an infection rate of 4% with both conventional and no-touch techniques [20], which is considerably lower than the incidence observed in our study. More recently, a retrospective single-centre analysis of prospectively collected data by our research group found no association between SSI and vein harvesting technique, although the total proportion of SSI was 17.1% [6]. However, several studies have indicated that the no-touch harvesting technique may carry an increased risk of SSI and leg wound complications [7,21,22]. Future research should examine whether this risk can be mitigated by adjustments in surgical technique for no-touch vein harvesting.

Limitations

Most importantly, the sample size was not determined specifically for the analyses performed in this sub-study of the SWEDEGRAFT trial. The results should therefore be interpreted with consideration of the limited number of SSI events and the resulting risk of both false-positive and false-negative findings.

The definition and ascertainment of SSI represent important limitations. SSI is a clinical diagnosis based on a combination of clinical findings and clinical assessment, and one subjective criterion is notably included in the CDC-classification [13]. Centralised, blinded assessment and adjudication of all leg wounds at 3 months were not feasible in the present study. We therefore used patient-reported antibiotic treatment for a leg wound complication as a simple and clearly defined proxy for clinically significant SSI. Antibiotic treatment constitutes an important component of the widely used ASEPSIS score and has been shown to correlate with clinically infected wounds [23,24]. However, the reported diagnoses and antibiotic treatments were not validated against medical records, and differences in regional prescribing practices may have affected the reported incidence of SSI.

Antibiotics were generally prescribed by physicians who were not involved in the study and were unaware of the patients' treatment allocation, often general practitioners, which may have reduced the risk of differential ascertainment between the harvesting groups. Although regional differences in antibiotic prescribing practices may have contributed to the observed differences between centres, we consider it less likely that they systematically biased the comparison between harvesting techniques or the associations with other patient-level risk factors. An alternative approach, with postoperative wound assessment performed locally at each participating centre, would itself have introduced a potential risk of observer bias.

Finally, the present study focused primarily on infectious wound complications. Other leg wound-related outcomes may also be clinically relevant. Disturbances in skin sensation were more common after no-touch harvesting, as previously reported [11], although in our clinical experience these symptoms are rarely considered important by patients unless specifically elicited. Surgical wound revision represents a more objective marker of severe wound complications than antibiotic treatment, but was considerably less frequent and therefore provided limited statistical power for risk-factor analyses. Furthermore, the decision to perform surgical revision is also dependent on clinical judgement.

Conclusions

Risk factors associated with SSI at the vein harvest site after CABG were the no-touch vein harvesting technique and poor left ventricular systolic function, while female sex almost reached significance. These findings may be informative for future study designs, could be considered in the preoperative assessment, and might help tailor the choice of vein harvest technique for individual patients.

Author contributions

CRediT: **Hanna Unosson**: Conceptualization, Formal analysis, Writing – original draft; **Magnus Dalén**: Data curation, Resources, Writing – review & editing; **Karin Jensevik-Eriksson**:

Formal analysis, Methodology, Writing – original draft, Writing – review & editing; **Henrik Hultkvist**: Investigation, Writing – review & editing; **Stefan James**: Conceptualization, Funding acquisition, Supervision, Writing – review & editing; **Anders Jeppsson**: Conceptualization, Investigation, Writing – review & editing; **Hans Henrik Kimose**: Investigation, Writing – review & editing; **Ivy Susanne Modrau**: Investigation, Project administration, Supervision, Writing – review & editing; **Sigurdur Ragnarsson**: Investigation, Writing – review & editing; **Ulrik Sartipy**: Formal analysis, Investigation, Methodology, Software, Writing – review & editing; **Stefan Thelin**: Conceptualization, Funding acquisition, Investigation, Project administration, Writing – review & editing; **Per Vikholm**: Investigation, Writing – review & editing; **Örjan Friberg**: Conceptualization, Formal analysis, Investigation, Project administration, Supervision, Writing – review & editing.

Declaration of generative AI tools

During the preparation of this work, the authors used Claude to check language and spelling. After using this tool, the authors reviewed and edited the content and take full responsibility for the content of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The SWEDEGRAFT trial was funded by grants from the Swedish Research Council (grant number VR 2017-00214) and the Swedish Heart Lung Foundation (grant number Hj-Lu 20170428).

Data availability statement

The data utilized in the study will be provided upon reasonable request following approval by the relevant authorities.

References

[1] Vrints C, Andreotti F, Koskinas KC, et al. 2024 ESC guidelines for the management of chronic coronary syndromes: developed by the task force for the management of chronic coronary syndromes of the European Society of Cardiology (ESC) Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J. 2024;45(36):3415–3537. doi: 10.1093/eurheartj/ehae177.

[2] Jessen ME. Efforts to improve bypass graft patency have not been "in vein. J Thorac Cardiovasc Surg. 2015;150(4):889–890. doi: 10.1016/j.jtcvs.2015.07.099.

[3] Schwann TA, Habib RH, Wallace A, et al. Operative outcomes of multiple-arterial versus single-arterial coronary bypass grafting. Ann Thorac Surg. 2018;105(4):1109–1119. doi: 10.1016/j.athoracsur.2017.10.058.

[4] Kodia K, Patel S, Weber MP, et al. Graft patency after open versus endoscopic saphenous vein harvest in coronary artery bypass grafting surgery: a systematic review and meta-analysis. Ann Cardiothorac Surg. 2018;7(5):586–597. doi: 10.21037/acs.2018.07.05.

[5] Sharma M, Fakih MG, Berriel-Cass D, et al. Harvest surgical site infection following coronary artery bypass grafting: risk factors, microbiology, and outcomes. Am J Infect Control. 2009;37(8):653–657. doi: 10.1016/j.ajic.2008.12.012.

[6] Unosson H, Nyman MH, Brynhildsen KF, et al. Risk factors for infection at the saphenous vein harvest site after coronary artery bypass grafting surgery: a retrospective cohort study. J Cardiothorac Surg. 2024;19(1):310. doi: 10.1186/s13019-024-02799-4.

[7] Deb S, Singh SK, de Souza D, et al. SUPERIOR SVG: no touch saphenous harvesting to improve patency following coronary bypass grafting (a multi-centre randomized control trial, NCT01047449). J Cardiothorac Surg. 2019;14(1):85. doi: 10.1186/s13019-019-0887-x.

[8] Olsen MA, Sundt TM, Lawton JS, et al. Risk factors for leg harvest surgical site infections after coronary artery bypass graft surgery. J Thorac Cardiovasc Surg. 2003;126(4):992–999. doi: 10.1016/s0022-5223(03)00200-9.

[9] Omer AM, Ahmed A, Elfatih MM. Assessment of risk factors associated with surgical site infection following abdominal surgery: a systematic review. BMJ Surgery, Interventions, & Health Technologies. 2023;5(1):e000182.

[10] Aghdassi SJS, Schröder C, Gastmeier P. Gender-related risk factors for surgical site infections. results from 10 years of surveillance in Germany. Antimicrob Resist Infect Control. 2019;8(1):95. doi: 10.1186/s13756-019-0547-x.

[11] Thelin S, Modrau IS, Duvernoy O, et al. No-touch vein grafts in coronary artery bypass surgery: a registry-based randomized clinical trial. Eur Heart J. 2025;46(18):1720–1729. doi: 10.1093/eurheartj/ehaf018.

[12] Ragnarsson S, Janiec M, Modrau IS, et al. No-touch saphenous vein grafts in coronary artery surgery (SWEDEGRAFT): rationale and design of a multicenter, prospective, registry-based randomized clinical trial. Am Heart J. 2020;224:17–24. doi: 10.1016/j.ahj.2020.03.009.

[13] National Healthcare Safety Network, Centers for Disease Control and Prevention. Surgical site infection (SSI) event. 2017 Published January 2017. Accessed May 20; 2025.

[14] Sandner S, Hirofuji A, Mantaj P, et al. Outcomes of no-touch vs conventionally harvested saphenous veins for coronary artery bypass surgery: a meta-analysis of randomized trials. Eur J Cardiothorac Surg. 2025;67(9):ezaf297. doi: 10.1093/ejcts/ezaf297.

[15] Hassoun-Kheir N, Hasid I, Bozhko M, et al. Risk factors for limb surgical site infection following coronary artery bypass graft using open great saphenous vein harvesting: a retrospective cohort study. Interact Cardiovasc Thorac Surg. 2018;27(4):530–535. doi: 10.1093/icvts/ivy137.

[16] Langelotz C, Mueller-Rau C, Terziyski S, et al. Gender-specific differences in surgical site infections: an analysis of 438,050 surgical procedures from the german national nosocomial infections surveillance system. Viszeralmedizin. 2014;30(2):114–117. doi: 10.1159/000362100.

[17] Arnaoutakis DJ, Scully RE, Sharma G, et al. Impact of body mass index and gender on wound complications after lower extremity arterial surgery. J Vasc Surg. 2017;65(6):1713–1718.e1. doi: 10.1016/j.jvs.2016.12.116.

[18] Larsson H, Hälleberg-Nyman M, Friberg Ö, et al. Perioperative routines and surgical techniques for saphenous vein harvesting in CABG surgery: a national cross-sectional study in Sweden. J Cardiothorac Surg. 2020;15(1):5. doi: 10.1186/s13019-020-1056-y.

[19] Panahi P, Ilyas AA, Lloyd C, et al. A review of the best method of leg wound closure following open harvesting of the long saphenous vein for coronary artery bypass grafting. Ann Med Surg (Lond). 2021;70:102855. doi: 10.1016/j.amsu.2021.102855.

[20] Pettersen Ø, Haram PM, Winnerkvist A, et al. Pedicled vein grafts in coronary surgery: perioperative data from a randomized trial. Ann Thorac Surg. 2017;104(4):1313–1317. doi: 10.1016/j.athoracsur.2017.03.076.

[21] Deng MX, Lee GS, Vervoort D, et al. No-touch saphenous vein: current understanding of the conduit 'less handled. Curr Opin Cardiol. 2024;39(5):417–425. doi: 10.1097/HCO.0000000000001149.

[22] Tian M, Wang X, Sun H, et al. No-touch versus conventional vein harvesting techniques at 12 months after coronary artery bypass grafting surgery: multicenter randomized, controlled trial. Circulation. 2021;144(14):1120–1129. doi: 10.1161/CIRCULATIONAHA.121.055525.

[23] Hall JC, Hall JL. Evaluation of a wound scoring method for patients undergoing cardiac surgery. J Hosp Infect. 1996;33(2):139–144. doi: 10.1016/s0195-6701(96)90098-5.

[24] Wilson AP, Weavill C, Burridge J, et al. The use of the wound scoring method 'ASEPSIS' in postoperative wound surveillance. J Hosp Infect. 1990;16(4):297–309. doi: 10.1016/0195-6701(90)90002-6.