



COMPARISON OF SKIP INCISION SAPHENOUS VEIN HARVEST AND OPEN CONVENTIONAL VEIN HARVEST FOR CORONARY ARTERY BYPASS GRAFTING IN INDIA

Surgery

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ABSTRACT

Objectives: Evaluation of the feasibility of saphenous vein harvest through interrupted skin incisions and the comparison of outcomes with continuous incision vein harvest technique.

Materials and methods: 60 patients were randomised into two groups of 30 and underwent saphenous vein harvest either by continuous incision vein harvesting (CVH) or interrupted skin incision harvesting (IVH) for coronary artery bypass surgery. Intraoperative and post-operative outcomes were examined.

Results: Mean harvesting time in for CVH group was significantly less when compared to the IVH group ($p < 0.05$). More vein per incision length was harvested by the interrupted method as compared to the continuous method ($p < 0.05$) when comparing the two groups. However, more time was required to harvest per centimetre vein per minute using the interrupted technique ($p < 0.05$). Operative duration was similar in both groups. There was significantly less pain and better cosmesis scores in the interrupted skin incision group in the early postoperative period ($p < 0.05$).

Conclusions: Interrupted skin incision vein harvest is a feasible technique without increasing the duration of surgery and significantly reduces pain in the early postoperative period.

KEYWORDS

Coronary artery bypass grafting surgery, Saphenous vein harvest, Skip incision vein harvest

INTRODUCTION

Coronary artery bypass grafting (CABG) is one of the most commonly performed cardiac procedure in the world. Commonly used bypass conduits are the saphenous vein grafts, internal mammary artery and radial artery.

Saphenous veins are most commonly used because of their easy accessibility, flexibility of harvesting, longer length and low propensity for spasm or compromise in flow during low cardiac output states.

Saphenous vein harvesting wound complications include paraesthesia, skin edge necrosis, skin flap necrosis, seroma formation and wound infection requiring at times debridement, secondary suturing or skin grafting which prolong hospital stay and increase cost.^[1]

In endoscopic vein harvest, a small incision at a suitable site is made along the course of the great saphenous vein and a small length of the vein is dissected free. The tributaries of the vein are clipped and divided.^[2] This technique requires expensive equipment which requires regular maintenance, repair and replacement. In addition the technique requires a considerable learning curve.^[3]

In conventional saphenous vein harvesting, a single long incision starting from just above and anterior to the medial malleolus is made and extended along the course of the vein with ligation and division of the tributaries till the desired length of vein is acquired.^[4]

In our study we evaluated the feasibility of saphenous vein harvest through interrupted skin incisions.

MATERIALS AND METHOD

Study setting: Department of CTVS, Advanced Cardiac Centre, PGIMER, Chandigarh, India.

Study population: Patients with Coronary artery disease requiring CABG as a treatment modality

Sample size: 30 patients in each arm. 60 total cases

Study duration: July 1st 2015 to December 31st 2016

Study design: A total of 60 patients were enrolled in this study and were randomised into two groups:

- Group 1- Conventional vein harvest (CVH) group
- Group 2- Interrupted skin incision harvest (IVH) group

Inclusion criteria:

1. Patients scheduled for elective CABG
2. Both sexes.
3. Patients consenting to the procedure.

Exclusion criteria:

1. Urgent or Emergent surgery
2. Varicose veins
3. History of deep vein thrombosis
4. Patients not consenting to the procedure

Surgical techniques

Preoperative preparation

1. Routine cardiac surgical and anesthetic procedures were employed.
2. Course of the great saphenous vein was mapped by Doppler study using the Sonosite M-Turbo® ultrasound system with HFL38X (13-6Mhz) probe and marked with skin marker.
3. All legs were prepared by Povidone Iodine prior to vein harvesting
4. A single surgeon harvested all veins in the IVH group and the CVH group.
5. The wounds were closed as soon the vein was harvested and covered with a dry sterile dressing. All legs were wrapped with an elastic bandage until the next morning.

Technique

1. Conventional Vein Harvest (CVH)

The saphenous vein was exposed through a longitudinal continuous incision over the vein starting 3-4cm proximally to the medial malleolus. The incision was extended proximally along the course of

the vein beyond the knee joint till the required length. Side branches were divided between ligating clips and/or ligatures of silk. After the vein was removed it was filled and manually distended with heparinized autologous blood, kept at room temperature until used for grafting. The wound was closed in two layers: a subcutaneous running absorbable suture of absorbable suture and the skin was closed with staples.

2. Interrupted Skin Incision Vein Harvest (IVH)

The saphenous vein was exposed through a longitudinal continuous incision over the vein starting 3-4cm proximally to the medial malleolus.

Subcutaneous tunnels along the course of the vein were dissected with sharp and blunt dissection and by the use of retractor with long retracting blade. (Figure 1)

Side branches were divided between ligating clips or silk suture ligation. The length of vein mobilized under the subcutaneous tunnel was brought to the skin surface through a skip incision and another subcutaneous tunnel was dissected to harvest the remaining length of vein required. Incision over the knee joint was avoided (Figure 2). After the vein was removed it was filled and manually distended with heparinized autologous blood, kept at room temperature until used for grafting. The incision wounds were closed in two layers: a subcutaneous running absorbable suture of absorbable suture and the skin was closed with staples.

Definition of Variables

1. Harvest site: Whether site of harvest is calf/thigh
2. Incision length in centimeters
3. Harvest time: This starts with skin incision and ends with complete skin closure and includes vein preparation measured in cm/min.
4. Vein harvested per incision length measured in cm/cm
5. Duration of surgery: From start of skin incision to closure.
6. Wound pain on postoperative day 1,7,21 by the Visual Analog Scale with a score of 1 being no pain to a score of 10 worst possible pain
7. Graft harvest site complications
 - a) Paresthesia: Defined by sensation of tingling, tickling, pricking, or burning of with no apparent long term physical effect.
 - b) Erythema: defined as redness of the skin
 - c) Ecchymosis: defined as hemorrhagic non-fluctuating macules in the skin >2 cm in diameter.
 - d) Purulent leg wound infection: defined as infection in the skin and subcutaneous tissue with purulent secretion from the wound and/or surgical wound revision or rupture with positive culture from evacuated material and/or bacteria isolated from a subcutaneous or a subfascial collection in primarily closed wounds,
 - e) Hematoma: defined as a localized collection of blood with fluctuance
 - f) Seroma: defined as collection of serum in the tissues
 - g) Wound dehiscence: a superficial, partial or complete separation of the layers of surgical wound requiring additional need of wound cleansing and changing of wound dressings,
8. Hospital stay: defined as the time from the day of surgery until discharge to the home
9. Cosmetic result as judged by the patient on a scale graduated as follows:

Unacceptable = 1, not satisfied = 2, satisfied = 3, very satisfied = 4 and extremely satisfied = 5.

Study end point

The endpoint of the study was at postoperative day 21 and all variables were analyzed.

STATISTICAL ANALYSIS

Discrete categorical data was presented as *n* (%); continuous data was given as mean \pm SD & range or median and interquartile range, as appropriate. Normality of quantitative data was checked by measures of Kolmogorov Smirnov tests of normality. If data was normally distributed independent *t*-test was applied for comparison of 2 groups. Mann-Whitney *U*-test was used for statistical analysis of skewed continuous variables or ordered categorical data. Proportions were compared using Chi square or Fisher's exact test whichever is

applicable. All statistical tests were two-sided and performed at a significance level of $\alpha=0.05$. Analysis was conducted using SPSS for Windows (version 22.0; SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 60 patients were recruited and divided in two groups of 30. CABG of the patients was done by different surgeons of this department but the vein harvesting by either technique was done by the study investigator only. There was a mortality of 9(15%) patients in this study.

Demographic variables

Of the 60 patients recruited 45(75%) were males and 15(25%) (Table 1). In the CVH arm 25(83%) were males and 5(17%) were females whereas in the IVH arm 20(66%) were males and 10(34%) were females (Table 1). The mean age of patients in the CVH and IVH each arms were 59.47 ± 1.71 years and 60.33 ± 1.20 years and was normally distributed (Table 1). The gender distribution (Table 1) for males in CVH arm was 25(83%) and 20(66%) in IVH arm and their distribution was normal. Females were 5(17%) in the CVH arm and 10(34%) in IVH arm and were normally distributed. In total, 9(15%) patients expired during the study period wherein the IVH arm there were 4 (13%) deaths whereas in the CVH arm there 5(16%) deaths and were found to be not significant on comparison by Pearson chi square test ($p=0.71$). 25 patients were studied in the CVH arm and 26 patients were studied in the IVH arm. In the CVH arm, 6/30 (20%) had COPD, 13/30 (43.3%) were diabetics, 19/30 (63.3%) were hypertensives and 7/30 (23.3%) were smokers. In the IVH arm, 4/30 (13.3%) had COPD, 16/30 (53.3%) were diabetics, 16/30(53.3%) were hypertensives and 5/30 (16.6%) were smokers. Risk factors were normally distributed in each arm and were not significant on comparison by Pearson chi square test (Table 1). Mean BMI in the study population was 24.61 ± 3.53 kg/m² (Table 1). The mean BMI in CVH arm was 24.13 ± 0.54 kg/m² and IVH arm was 25.10 ± 0.72 kg/m². There was no significance of BMI on comparison by Pearson chi square test.

In the CVH arm, vein was harvested from calf in 19(64%), thigh in 2(6%) and whole leg in 9(30%) cases (Table 1) In the IVH arm, vein was harvested from the calf in 17(56%) and leg in 13(44%) cases (Table 1).

Operative variables

Overall mean harvesting time in for CVH group was significantly less when compared to the IVH group (45 ± 27.28 vs. 48.4 ± 15.60 minutes) (Table 1). More vein per incision length was harvested by the interrupted method as compared to the continuous method (1.53 ± 0.41 cm vs. 1.06 ± 0.11 cm, $p < 0.05$) when comparing the two groups. However, more time was required to harvest per centimetre vein per minute using the interrupted technique (1.34 ± 0.55 vs. 0.78 ± 0.33 , $p < 0.05$).

When harvesting vein from thigh and calf (Table 1), mean harvesting time in for CVH group was 43.88 ± 15.83 min and IVH group was 54.38 ± 13.93 min and were not significantly different ($p > 0.05$). Mean vein length (cm) harvested was significantly more by the continuous technique (51.11 ± 14.90 cm vs. 39.23 ± 13.65 cm, $p < 0.05$). However mean incision lengths were significantly less by the interrupted technique (47.33 ± 15.63 cm vs. 30.88 ± 14.18 cm, $p < 0.05$). More vein per incision was harvested by the interrupted technique (1.11 ± 0.10 cm vs. 1.36 ± 0.34 cm, $p < 0.05$) but this method took significantly more time centimetre vein harvested (1.28 ± 0.57 vs. 0.73 ± 0.24 cm/min, $p < 0.05$).

When harvesting vein from the calf, mean harvest time was not significantly different between the two techniques (42.63 ± 30.22 vs. 43.88 ± 15.65 minutes, $p > 0.05$). However, significantly more vein was harvested by the continuous technique (45.57 ± 15.98 cm vs. 32.35 ± 9.81 cm, $p < 0.05$). Mean incision lengths were significantly less by the using the interrupted technique (44.05 ± 17.05 cm vs. 19.88 ± 6.20 cm, $p < 0.05$). More vein per incision length was harvested by using the interrupted technique (1.05 ± 0.12 cm vs. 1.67 ± 0.42 cm, $p < 0.05$). However, less vein per minute was harvested by using the interrupted harvest technique (1.38 ± 0.60 vs. 0.82 ± 0.39 cm/min), *n* harvest using the interrupted technique.

Isolated thigh vein was harvested only by the continuous method with mean harvest time of 72.5 ± 38.89 minutes and mean harvest length of 89 ± 43.84 centimetre and could not be compared with isolated thigh

vein harvest using the interrupted technique. The mean duration of surgery in the CVH arm was 385 ± 17 minutes and in the IVH arm was 394 ± 22 minutes and was not significant on comparison by paired t test ($t=0.32, p>0.05$)

Comparison of outcomes

Pain

The mean pain scores (Table 2) on day 1 in the CVH arm was 5.12 ± 0.397 and IVH arm was 4.12 ± 0.386 . There was no significant difference of pain on day 1 in both arms in CVH and IVH arms ($p>0.05$) on comparison with unpaired t-test. Mean pain scores on day 7 were 3.00 ± 1.55 in the CVH arm and 2.12 ± 1.243 in the IVH arm and pain scores were significantly less in the IVH arm ($p<0.05$).

On day 21 mean pain scores were 1.28 ± 0.178 in the CVH arm and 1.12 ± 0.085 in the IVH arm and there was no significance in both arms ($p>0.05$)

Paresthesia

Comparison of paresthesia (Table 2) in each arm of the study was observed on post-operative day 1, 7 and 21.

In the CVH arm paresthesia was present in 17 (68.0%) patients and 13 (50.0%) in IVH patients on day 1 ($p>0.05$). In the CVH arm paresthesia was present in 13 (52.0%) patients and 10 (38.5%) in IVH patients on day 7 ($p>0.05$). In the CVH arm paresthesia was present in 13 (52.0%) patients and 10 (38.5%) in IVH patients on day 21 ($p=0.05$). No significance was observed in paresthesia in both arms on comparing with chi square test on each day.

Erythema

Comparison of the presence of erythema in the CVH and IVH arm were done on days 1, 7 and 21 (Table 2). Erythema on day 1 was present in 10 (40.0%) CVH arm and 10 (38.5%) IVH arm ($p=0.910$). On day 7 it was present in 5 (20.0%) CVH arm and 2 (8.0%) IVH arm ($p>0.05$) and on day 21 was present in 0 (0.0%) CVH arm and 1 (4.0%) IVH arm ($p>0.05$). There was no statistical significance of erythema on days 1, 7, 21 on either arm on comparison with chi square test.

Ecchymosis

Comparison of the presence of ecchymosis (Table 2) in the CVH and IVH arm were done on days 1, 7 and 21. Ecchymosis on day 1 was present in 3 (12.0%) CVH arm and 4 (15.4%) IVH arm ($p>0.05$)

On day 7 it was present in 2 (8.0%) CVH arm and 1 (3.8%) IVH arm ($p>0.05$) and on day 21 was present in 1 (4.0%) CVH arm and 1 (4.0%) IVH arm ($p>0.05$). There was no statistical significance of ecchymosis on days 1, 7, 21 on either arm on comparison with chi square test.

Purulent wound infection

Analysis of presence of purulent wound infection (Table 2) was done on both arms and compared on days 1, 7, 21. Purulent wound infection on day 7 was present in 1 (4.3%) CVH arm and 2 (7.7%) IVH arm ($p>0.05$)

Purulent wound infection on day 21 was present in 1 (4.0%) CVH arm and 1 (3.8%) IVH arm ($p>0.05$)

There was no statistical significance of ecchymosis on days 1, 7, 21 on either arm on comparison with chi square test

Hematoma

On day 1 hematoma (Table 2) was present in 4 (16.7%) of the CVH arm and 1 (3.8%) of the IVH arm ($p>0.05$). Hematoma was present in 3 (12.5%) patients of the CVH arm and 3 (11.5%) in the IVH arm ($p>0.05$) on day 7 (Table 2). There was no hematoma formation on day 21 in both the arms.

There was no significance of technique on hematoma formation in either arm.

Seroma formation

There was no seroma formation (Table 2) in both arms on day 0, however there was 1 case each in both arms on day 7 CVH (4%) and IVH (4.2%) respectively. On day 21 one case in the CVH arm continued having serous discharge and none in the IVH arm ($p>0.05$). No significance in technique regarding seroma formation in both arms was seen. No cellulitis was seen in both arms of the study on days 1, 7, 21.

Wound dehiscence

No wound dehiscence (Table 2) was seen on day 1 or day 21 of the CVH arm. However wound dehiscence was seen in 3 patients of CVH arm on day 7. Wound dehiscence in the IVH arm was observed in 1 patient (Table 2) each on day 7 and day 21. There was no statistical difference in the wound dehiscence rates in both arms on days 7 and 21. Mean duration of hospital stay (Table 2) in CVH arm was 11.68 ± 0.854 days and 10.58 ± 0.964 days in IVH arm and was not significant on comparison of technique using unpaired t test ($p>0.05$).

Cosmesis scores

The mean cosmesis scores (Table 2) in the CVH arm was 2.96 ± 0.168 and 3.69 ± 0.121 in the IVH arm.

Patients were more satisfied with the cosmetic outcomes of the interrupted skin incision harvest technique than the conventional long skin incision technique ($p<0.05$).

Hospital stay

There was no significant difference (Table 2) in the difference in the mean hospital stay (11.68 vs. 10.5 days, $p>0.05$)

DISCUSSION

Saphenous vein graft harvest is usually done by the junior member of the surgical team. Complications of saphenous vein graft harvest are many such as paraesthesia, skin margin necrosis, flap necrosis, seroma, hematoma formation particularly in thigh and wound infection.^[1] Wound and scar pain particularly when incision crosses the knee joint is common. Quite often, conventional technique of saphenous vein graft harvesting full incision is made along the complete length of the vein. In endoscopic vein harvesting, a short length incision is made and endoscope with lighting is introduced and a tunnel is created along the course of the vein and tributaries are dissected and clipped. This technique requires considerable cost and training. In our study, we adopted short length skin incision, with dissection of vein and tunnelling proximally and distally through the incision along the course of the vein. The vein tributaries were clipped and divided and skin incision over the knee joint was completely avoided. This technique does not require special instruments other than Metzenbaum curved scissors, a pair of Allis' forceps and clip applicators.

We recommend surgical headlight for better illumination while tunnelling, dissecting the branches, clipping and dividing them as ceiling suspended OT light is not enough. We found that the scrub nurse holding and lifting the Allis forceps which we applied to the incised skin edges helps the surgeon a lot to do the procedure as both hands are free. We could harvest 35cm of saphenous vein graft from 24cm of skin incision by using interrupted skin incision harvest technique while in the continuous incision vein harvest technique 50 cm of vein could be harvested for 47cm skin incision (Table 1). This was also seen by Tran et al^[5] where length of vein harvested in the tunnelling group was 38.8 ± 13.1 cm and in the open group was 42.1 ± 8.3 ($p=0.12$). Black et al^[6] reported similar results wherein 4 (3.5–4.6) cm of vein was harvested for every 1 cm of skin incision and 1 (1–1) cm for every cm of skin incision ($p=0.01$). The overall harvesting time was not significantly longer in the IVH group as compared to the CVH group and overall operating time was comparable. This was comparable to the study by Tran et al^[5] wherein the time taken in the tunnelling group was 43.8 ± 24.8 minutes and 43.9 ± 22.9 minutes in the open group ($p=0.67$). Also, Markar^[7] et al in their meta-analysis found that the pooled random effects was 6.31 [95% confidence interval (CI) –18.20–5.57, $p=0.29$]; thus harvest time did not favour either open or minimally invasive technique. We found no difference in terms of ecchymosis, incision edge necrosis, flap necrosis and wound infection in both groups. But lesser degree of pain and more cosmetic satisfaction was significantly more in the IVH group. This was comparable to the studies by Tran et al^[5] where pain scores in open incision group was 1.8 ± 0.83 and in the minimally invasive incision group was 1.2 ± 0.44 ($p=0.001$). Andreasen et al^[8] also reported lesser pain scores in the minimally invasive harvest group (0.87 ± 1.22 vs. 0.52 ± 1.04) though the scores were not significant. Black et al^[6] also reported significant lesser pain score in the skip incision group (22% vs. 11%, $p=0.04$). There was no skin bridge complication in between the incision and as there was no wound and scar across the knee, patients felt more comfortable and mobilized early. This is a significant advantage. Incision over the medial malleolus should be avoided, as here the skin tends to heal poorly. If a few centimetres length of vein is required, it should be harvested by tunnelling.

CONCLUSION

Interrupted skin incision vein harvest is a feasible technique without increasing the duration of surgery and significantly reduces pain in the early postoperative period.

Disclosure of funding

None

Disclosure of conflict of interest

None



Figure 1: Long blade retractor in situ for interrupted vein harvest



Figure 2 Interrupted vein harvest

	N=9	N=13	t=-1.64, p=0.05, p>0.05
Calf and thigh vein harvest			
Mean harvest time (min)	43.88 ± 15.83	54.38 ± 13.93	t=1.93, p=0.03, p<0.05
Mean vein length (cm)	47.33 ± 15.63	39.23 ± 13.65	t=2.56, p=0.009, p<0.05
Mean incision length (cm)	1.11 ± 0.10	1.36 ± 0.34	t=-2.23, p=0.03, p<0.05
Vein/ incision (cm/cm)	1.28 ± 0.57	0.73 ± 0.24	t=3.30, p=0.001, p<0.05
Vein length/min (cm/min)			
Calf vein harvest			
Mean harvest time (min)	42.63 ± 30.22	43.88 ± 15.65	t=0.19, p=0.84, p>0.05
Mean vein length (cm)	44.05 ± 17.05	32.35 ± 9.81	t=2.98, p=0.002, p<0.05
Mean incision length (cm)	1.05 ± 0.12	1.67 ± 0.42	t=4.99, p=0.00001, p<0.05
Vein/ incision (cm/cm)	1.38 ± 0.60	0.82 ± 0.39	t=-6.34, p<0.00001, p<0.05
Vein length/min (cm/min)			t=3.32, p=0.002, p<0.05
Thigh vein harvest			
Mean harvest time (min)	72.5 ± 38.89	0	
Mean vein length (cm)	89 ± 43.84	0	
Mean incision length (cm)	85 ± 42.42	0	
Vein/ incision (cm/cm)	1.04 ± 0.00	0	
Vein length/min (cm/min)	1.24 ± 0.06	0	
Duration of surgery (min)	385±17	394±22	t=0.32, p=0.74, p>0.05

Table 2 Comparison of outcomes

VARIABLE	CVH(n=25)	IVH(n=26)	p value
Pain score Day 1	5.12±0.3	4.12±0.3	0.07
Pain score Day 7	3.0±1.5	2.12±1.2	0.03
Pain score Day 21	1.28±0.17	1.12±0.08	0.41
Paresthesia Day 1	17 (68%)	13 (50%)	1.192
Paresthesia Day 7	13 (52%)	10 (38.5%)	0.331
Paresthesia Day 21	13 (52%)	10 (38.5%)	0.331
Erythema Day 1	10 (40%)	10 (38.5%)	0.910
Erythema Day 7	5 (20%)	2 (8%)	0.221
Erythema Day 21	0 (0%)	1 (4%)	0.312
Ecchymosis Day 1	3 (12%)	4(15.4%)	0.725
Ecchymosis Day 7	2 (8%)	1 (3.8%)	0.529
Ecchymosis Day 21	1 (4%)	1 (4%)	1.00
Hematoma Day 1	4 (16.7%)	1 (3%)	0.131
Hematoma Day 7	3 (12.5%)	3 (11.5%)	0.917
Hematoma Day 21	0	0	0
Seroma Day 1	0	0	0
Seroma Day 7	1 (4%)	1 (4%)	0.976
Seroma Day 21	1 (4%)	0	0.303
Wound dehiscence Day 1	0	0	0
Wound dehiscence Day 7	3	1	0.297
Wound dehiscence Day 21	0	1	0.322
Cosmesis score	2.96±0.168	3.69±0.121	0.00
Hospital stay (days)	11.68	10.58	0.39

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Table 1 Demographic and operative variables			
DEMOGRAPHIC VARIABLES			
	CVH(n=30)	IVH(n=30)	p value
Males	25(83%)	20(66%)	
Females	5(17%)	10(34%)	
Age (years)	59.47±1.71	60.33±1.20	t=-0.4, p=0.68, p>0.05
Mortality	4 (13%)	5 (16%)	X ² =0.13, p=0.71, p>0.05.
Risk factors			$\chi^2=0.48, p=0.48, p>0.05$
COPD	6	4	
Diabetes Mellitus	13	16	$\chi^2=0.60, p=0.43, p>0.05$.
Hypertension	19	16	
Smoking	7	5	$\chi^2=1.70, p=0.19, p>0.05$.
BMI (kg/m ²)	24.13 ± 0.54	25.10 ± 0.72	$\chi^2=0.41, p=0.51, p>0.05$. t=-1.06, p=0.29, p>0.05
OPERATIVE VARIABLES			
	CVH(n=30)	IVH(n=30)	p value
Site of harvest			t=5.39, p<0.00001, p<0.05
Calf	19 (64%)	17 (56%)	
Thigh	2 (6%)	13 (44%)	
Calf and thigh	9 (30%)	0 (0%)	
Mean incision length (cm)	47.76 ± 20.36	24.65 ± 11.62	t=0.59, p=0.55, p>0.05
Mean vein length harvested (cm)	50.13 ± 20.10	35.33 ± 11.92	t=3.46, p=0.0009, p<0.05.
Mean harvest time (min)	3.86 ± 0.57	1.06 ± 0.11	t=2.08, p=0.04, p<0.05.
Mean number of grafts	1.34 ± 0.55	15.60	t=5.95, p<0.00001, p<0.05
Vein/ incision (cm/cm)		3.5 ± 0.77	t=4.73, p=0.00001, p<0.05
Vein length/min (cm/min)		1.53 ± 0.41	
		0.78 ± 0.33	

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