

Comparing sizes of venous cannulation sites and local complications between buttonhole (BH) and sharp-needle (SN) techniques for hemodialysis (HD).

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Abstract

Introduction: Buttonhole (BH) is an alternative AVF cannulation technique, in which the needles are inserted at exactly the same locations for every dialysis session compared to conventional sharp needle technique whereby insertion is performed at varying sites.

Objective: This study compared the sizes of venous cannulation sites and local complications between buttonhole and sharp-needle techniques for HD.

Methodology:

The study protocol was approved by the local Medical Training Department and Board Of Directors. Consecutive, non diabetic patients who commenced HD from 2009, who satisfied the inclusion criteria and gave informed consent were included. A survey questionnaire was administered by the first Researcher and the following parameters obtained – patient demographics, cannulation technique and time, pain severity (NRS-11), patient satisfaction (VAS), sizes of arterial and venous cannulation sites, history of bleeding, thrombosis infiltration and aneurysm formation and size. Data were analysed using SPSS V20.0

Results: A total of 8 (mean age 47.13±9.66) HD patients using BH technique were compared with 16 (mean age 52.96±14.10) using SN technique. Patients in the BH group had longer cannulation time (>3 mins vs <3 mins, $p < 0.001$) lower pain score (mean score 2.25±2.76 vs 4.44±1.79, $p < 0.02$), higher satisfaction score (mean score 9.38±1.77 vs 6.50±0.89, $p < 0.001$), fewer local complications of bleeding ($p > 0.26$), infiltration ($p > 0.53$) and aneurysm formation ($p < 0.001$), vein diameter is better at arterial site (<2cm vs >2cm, $p < 0.002$) and venous site (<2cm vs >2cm, $p > 0.26$) compared to those in SN groups. No bacteremic episode and was recorded in both groups.

Conclusion: This study showed that the BH method is a valuable, safe and patient-friendly AVF cannulation technique for centre-based HD units. It deserves to be more widely adopted.

Keywords: AVF, buttonhole technique, sharp needle, cannulation, complications

Introduction

The study was conducted from January 2016 to March 2016 in MAA Medicare Charity Dialysis JB1 and JB2. By criteria given prior the study they are 8 participants of buttonhole needling and 16 participants using of sharp needling technique were recruited. No defaulter during the study. We were assisted by a zone manager and post basic nurses throughout this study. A survey study of assisted- administered questionnaire was conducted for both techniques.

Descriptive statistics such as frequency and percentage were used for demographic profile of gender, race, types of AVF, duration using of buttonhole and causes of ESRD for two groups of patients. Relationships between studied variables were identified through Fisher exact Test.

Demographics profile of patients

Table 1.1 below shows the frequency for socio demographic data which includes gender, race, types of AVF duration using of buttonhole and causes of ESRD for two groups of patients; blunt needle group and sharp needle group. Sharp needle group will represents as control group. Out of 8 patients from blunt needle group, 7 (87.5%) are female, 1 (12.5%). 7(87.5%) of them using RCF fistula and 1(12.5%) patient using BCF. For control group, 8 (50%) male,15 (93.75%) are using RCF fistula.

Mean age for buttonhole group is 47.13 ± 9.66 years old whereas control group is 55.88 ± 14.10 years old. Majority of both group had dialysis less than 5 years, 7(87.5%) for buttonhole group and 13(81.25%) for control group. All 8 participants from buttonhole group were on the technique for the last 4 years. All demographics and co-morbidities showed no association between both techniques ($P > 0.05$).

Comparisons of demographics and comorbidities between the buttonhole and sharp needle groups

Characteristics	BN(n=8)	SN (n=16)	P -value
Age			
30-49	6 (75.0%)	6 (37.5%)	0.20
50-59	1 (12.5.0%)	3(18.75%)	
>60	1 (12.5%)	7 (43.75%)	
Mean ± SD	47.13± 9.66	52.96±14.10	
Gender			
Female	1 (12.5%)	8 (50.0%)	0.18
Male	7 (87.5%)	8(50.0%)	
Race			
Malay	2(25.0%)	4 (25.0%)	0.57
Chinese	6 (75.0%)	10(62.5%)	
Indian	0 (0.0%)	2 (12.5%)	
Year HD commenced			
2009	1 (12.5%)	2(12.5%)	0.78
2010	0 (0.0%)	1 (6.25%)	
2011	3 (37.5%)	5(31.25%)	
2012	4 (50.0%)	6 (37.5%)	
2013	0 (0.0%)	2 (12.5%)	
Year fistula Created			
2008	0(0.0%)	1(6.25%)	0.64
2009	0(0.0%)	2(12.5%)	
2011	4(50.0%)	5(31.25%)	
2012	4 (50.0%)	7(43.75%)	
2013	0 (0.0%)	1(6.25%)	
Causes of ESRD			
Hypertension	6 (75.0%)	13(81.25%)	0.60
Others(non DM)	2 (25.0%)	3(18.75%)	
Duration used (Year)			
2	5 (62.5%)	3 (18.75%)	0.25
3	2 (25.0%)	5 (31.25 %)	
4	1 (12.5%)	5 (31.25%)	
5	0(0.0%)	1 (6.25%)	
6	0(0.0%)	2 (12.5%)	
Mean ± SD	2.50 ± 0.76	3.62 ± 1.26	

Complications and venous site changes between BH and SN groups

Characteristics	BH (n=8)	SN (n=16)	P –value
Types AVF			
Radio cephalic Fistula (RCF)	7(87.5%)	15(93.75%)	1.00
Brachial cephalic Fistula(BCF)	1(12.5%)	1(6.25%)	
Local Complications			
Aneurysm			
Yes	0(0.0%)	14(87.5%)	0.001
No	8 (100%)	2 (12.5%)	
Infiltration			
Yes	0 (0.0%)	3 (18.8%)	0.53
No	8 (100%)	13(81.2%)	
Thrombosis			
Yes	0 (0.0%)	0(0.0%)	NIL
No	8 (100%)	16 (100%)	
Bleeding			
Yes	0 (0.0%)	5(31.25%)	0.13
No	8 (100.0%)	11 (68.75%)	
Vein diameters at puncture sites			
Arterial			
<2cm	8 (100%)	5 (31.25%)	0.002
>2cm	0 (0.0%)	11(68.75%)	
Venous			
<2cm	8 (100%)	12 (75.0%)	0.26
>2cm	0 (0.0%)	4 (25.0%)	

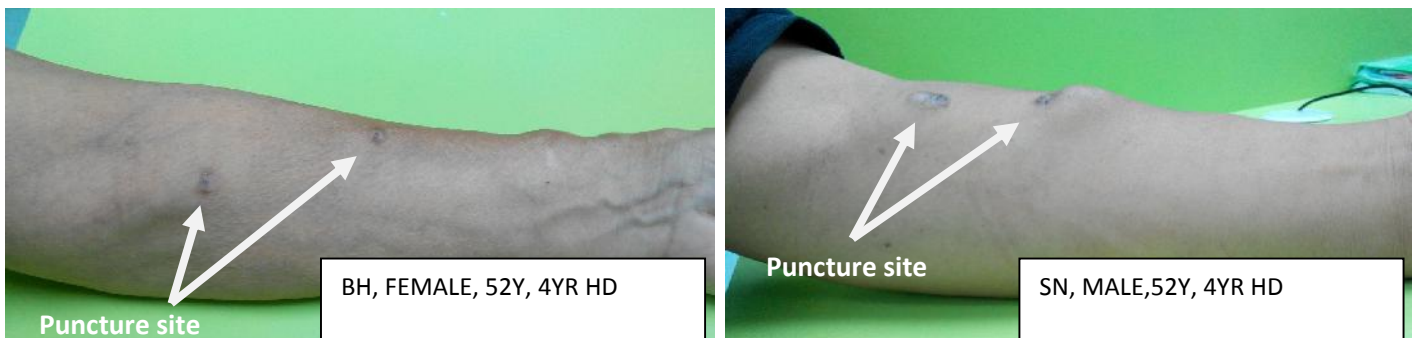
Most of patients were on Radio-cephalic fistula (RCF). Aneurysm formation like vein enlargement occurred significantly more often ($p < 0.001$) in SN group (87.5%) compared to patients in BH group (0%). Track guided tunnel as in buttonhole shows no episode of accidental infiltration whereas we had 3(18.8%) accidental infiltration in control group. There is no excessive vein enlargement arterial and venous puncture site. In control group, 11(68.75%) had vein enlargement at arterial puncture site ($p < 0.002$) and 4(25%) at venous puncture site.

Comparison pain score, satisfaction and time taken between buttonhole and sharp needle techniques

Characteristics	BH (n=8)	SN(n=16)	P -value
Cannulation time			
< 3minutes	0 (0.0%)	16 (100%)	0.001
>3minutes	8 (100%)	0 (0.0%)	
Pain score			
0 (no pain)	3(37.5%)	0(0.00%)	0.02
1-3 (mild)	3(37.5%)	4(25.00%)	
4-6 (moderate)	1(12.5%)	11(68.75%)	
7-10 (severe)	1(12.5%)	1 (6.25%)	
Mean ± SD	2.25 ± 2.76	4.44 ± 1.79	
Patient satisfaction			
(1-2) not satisfied	0 (0.0%)	0 (0.0%)	0.001
(3-4) less satisfied	0 (0.0%)	0 (0.0%)	
(5-6) satisfied	1 (12.5%)	4(25.0%)	
(7-8)very satisfied	0(0.0%)	12 (75.0%)	
(9-10)extremely satisfied	7(87.5%)	0 (0.0%)	
Mean ± SD	9.38 ± 1.77	6.50 ± 0.89	

Patients with the BH, 8 patients had a longer cannulation time (>3minutes, p <0.001) compared to SN patients and no pain (p <0.02) and higher satisfaction scores (p <0.001). The time cannulation, pain score and patient satisfaction had association between techniques.

CANNULATION SITE IMAGES



Relationship between venous sites with BH or SN techniques

H_0 : There was no relationship between venous sites with BH or SN techniques

H_A : There was a relationship between venous sites with BH or SN techniques

There was a significant association between arterial puncture site and needling technique ($p < 0.002$). Whereas there was no association between venous puncture site with needling technique ($p > 0.262$)

Relationship between aneurysm / infiltration formation with needling techniques

H_0 : There was no relationship between aneurysm / infiltration formation with needling techniques

H_A : There was a relationship between aneurysm / infiltration formation with needling techniques

There was association between aneurysm formations with needling techniques ($p < 0.001$).

Whereas, there was no association between infiltration incidence with needling techniques ($p > 0.526$).

Conclusion:

This study showed that the BH method is a valuable, safe and patient-friendly AVF cannulation technique for centre-based HD units. It deserves to be more widely adopted.