

# Landmark Based Femoral Central Venous Catheterization, A Reliable And Safe Method In Acute Burns Resuscitation: An Institutional Based Study.

Adil Mahmud Ali<sup>1</sup>, Ragya Bharadwaj<sup>2</sup>, Nafis Ahmad Faruqi<sup>3</sup>

<sup>1</sup>Senior Resident, Department of Plastic Surgery, JN Medical College, Aligarh Muslim University, Aligarh 202002, India.

<sup>2</sup>Senior Resident, Department of Anatomy, JN Medical College, Aligarh Muslim University, Aligarh 202002, India.

<sup>3</sup>Professor, Department of Anatomy, JN Medical College, Aligarh Muslim University, Aligarh 202002, India.

Received: June 2018

Accepted: June 2018

**Copyright:** © the author(s), publisher. It is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Central Venous Catheterizations (CVC) is a standard method of intravenous access in resuscitation of acute severe burn patients, with the subclavian and internal jugular veins being preferred over the femoral vein. However the ease of placement and the decreased chance of life threatening complications make it an attractive and safe option for the burns physician. **Aims:** To study the efficacy femoral CVC in acute burns resuscitation. **Methods:** This is a prospective observational study conducted over a period of 2 years. Patients with acute severe burns were admitted, and landmark based femoral central venous catheter was placed for resuscitation. **Results:** A total of 300 femoral central lines were placed in 300 patients. In 84.66% patients the right femoral vein was used and 15.3% patients, left femoral vein was catheterized. In 65% patients catheterisation was done in one attempt while 34.33% patients required 2- 3 attempts. No use of ultrasound was required in any of our patients. The risk of catheter related blood stream infections due to femoral CVC was not higher when compared with CVC placement in other sites (subclavian/internal jugular). **Conclusion:** Landmark based femoral central venous catheterisation is a quick, reliable and safe method to attain venous access in acute severe burn patients with lesser chances of immediate life threatening complications when compared to other sites of placement.

**Keywords:** Femoral central venous catheterisation, Land mark technique, CLABSI.

## INTRODUCTION

Acute burns are a major cause of morbidity and mortality throughout the world.<sup>[1]</sup> In India, over 10,00,000 people are moderately or severely burnt every year.<sup>[1]</sup> After managing the airway and breathing, early and aggressive fluid resuscitation is the main stay of treatment.<sup>[2]</sup> Central venous catheters (CVC) placed by the Seldingers technique has revolutionised the treatment of patients in shock. With the addition of ultrasound guidance there is further refinement in the accuracy of placement and decrease in the rate of complications compared to landmark based CVC placement. But many developing countries are not equipped with ultrasound machines in the emergency set up and large influx of patients with the paucity of trained doctors makes land mark based CVC placements a

more practical approach.

The Centre for Disease Control (CDC) and prevention advises to avoid using the femoral or jugular vein for central venous access in adult patients (Category 1A), they rather recommend using a subclavian route in adult patients to minimize infection risk for non-tunneled CVC placement (Category IB).<sup>[3]</sup> However recent meta-analysis have not shown significantly higher rates of infection by the femoral CVC placement when compared to other sites.<sup>[4,5]</sup>

Femoral CVC placement using the Landmark based technique is a routine practice to manage patients of acute severe burns. The aim of the present study is to find out the safety and reliability of aforementioned technique used in our institution compared to Jugular or Subclavian CVC placement practiced in several other institutions.

## MATERIALS AND METHODS

This study is a prospective study conducted at the Post- graduate Institute of Burns, Plastic and Reconstructive Surgery in a tertiary care Institute in North India, over a period of two years from

### Name & Address of Corresponding Author

Dr Ragya Bharadwaj  
Department of Anatomy,  
J.N. Medical College,  
A.M.U., Aligarh,  
U.P., India.

February 2015 to February 2017. To conduct the above mentioned study, permission was taken from Institutional Ethics Committee.

A total of 300 femoral CVC were placed in 300 patients with acute severe burns (> 30 % TBSA deep 2nd and 3rd degree burns). Male: Female Ratio was 1.9:1, with 45% patients presenting in age group (18-25 years) and 82% patients presented with > 50% TBSA burns.

All patients of acute burns of TBSA  $\geq$  30% (deep 2nd and 3rd degrees) of both sexes above the age of 18 years were included in this study. Prior consent for CVC was taken from patients.

The right or left femoral vein was used for CVC placement. No use of USG was made and purely landmark based technique was used to place the femoral CVC. Once the patient was resuscitated the CVC was routinely changed at the 5th day, with the catheter tip and blood sent for culture and sensitivity.

### **Femoral CVC placement technique**

A line is drawn from the anterior superior iliac spine to the pubic tubercle, indicating the inguinal ligament. A point is marked on inguinal ligament, midway between anterior superior iliac spine and pubic symphysis (mid-inguinal point) [Figure 1]. A vertical line downwards from this point marks the femoral artery. The femoral vein is located 0.5-1cm medial to the pulsations of the femoral artery.

The Seldinger technique is used for femoral catheterization.<sup>[6]</sup> The patient is placed in supine position. The area is prepared using chlorhexidine and local anaesthesia is infiltrated at the site of puncture.

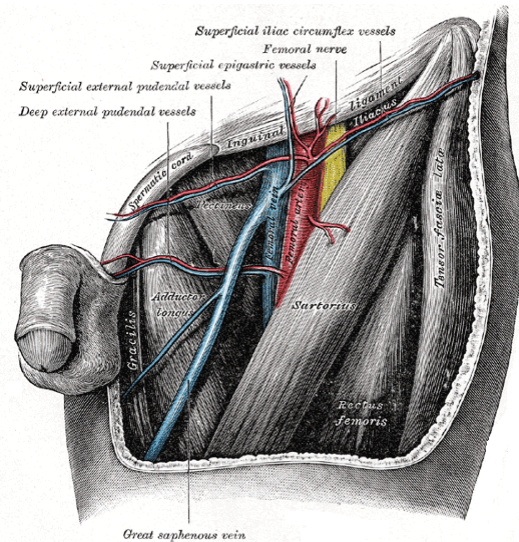
A fine 26 G “finder needle” is first placed 0.5-1cm medial to the pulsations of the femoral artery at an angle of 45 degrees to the skin and advanced with negative pressure [Figure 2]. A dark “flash” of blood indicates venous blood. Now, keeping the needle in place a larger 20-22 G needle is placed immediately adjacent to the finder needle to enter the femoral vein once again, and now a guide wire is passed through this for about 10-15 cm making sure the wire is passing with minimal resistance. The needle is now removed and a small nick is given with an 11 no. blade adjacent to the wire and a dilator is then passed over the guide wire to dilate the tract. Once this is done the femoral catheter is threaded over the guide wire slowly after the end of the guide wire is secured, and the wire is slowly withdrawn as the catheter is threaded forwards. The catheter is secured with nylon suture [Figure 3]. The placement of CVC can be confirmed by return of venous blood on aspiration.

### **RESULTS**

In 84.66% patients the right femoral vein was used and in 15.3% patients left femoral vein was catheterized. In 65% patients CVC was done in one attempt while 34.33% patients require 2- 3 attempts

for catheterization. No use of Ultrasound was required in all 300 patients for CVC placement. Accidental arterial puncture was noted in 18.66% patients who were managed conservatively. No patients had DVT or other severe catheter related complications.

Incidence of CLABSI in our patients was 18 per 1000 catheter days.



**Figure 1: Anatomy of Femoral Triangle**



**Figure 2: Surface Landmarking for Femoral Vein Catheterization.**



**Figure 3: Catheter (blue) placed in Femoral artery showing filling of transducer line with blood**

## DISCUSSION

The CDC has advised against the use of femoral site as a site for CVC due to higher chances of infection when compared to the subclavian site.<sup>[3]</sup> Lorenz et al (Spain) and Nagashima et al (Japan) reported a higher rate of CLABSI with the femoral route than the Subclavian route,<sup>[7,8]</sup> but a Meta-analysis done by Marik et al showed no higher chances of CLABSI by the femoral route.<sup>[4]</sup> We also in our study did not have a significantly higher rate of CLABSI (18 per 1000 catheter days) when compared to inpatient data of our Hospital general ICU(17.2 per 1000 catheter days), where the IJV or Subclavian Vein in used for CVC.

In a noncomparative prospective study, Joynt and colleagues reported that 9.6% of femoral CVC's were associated with DVT's,<sup>[9]</sup> we did not have any case of femoral CVC related DVT in our study.

Another potential reason to avoid the femoral site is to allow early mobilization; this is particularly true for dialysis catheters. CVC placement is somewhat of a daunting task in massively obese patients.<sup>[10]</sup> A subgroup analysis of the Parienti study suggests a higher risk of CLABSI with femoral placement in these patients; hence this site should be avoided.<sup>[10]</sup> In our study there were no massively obese patients admitted, this could be so as in India severe burns are most commonly reported in the poor socioeconomic classes.

Central venous catheterization by the subclavian or jugular route can have a complication rate as high as 12% with life threatening complications like haemothorax, pneumothorax, cardiac catheterization, carotid artery haematoma etc.<sup>[11,12]</sup> The femoral CVC route is hence safer although rare complications like accidental migration of the guide wire into the common iliac vein have been reported.<sup>[13,14]</sup> The usual complications are infection, haematoma, arterial puncture, kinking of guide wire, deep vein thrombosis, etc.<sup>[15,16]</sup>

The most common complication in our study was arterial puncture in 18.66% patients followed by CLABSI (18 per 1000 catheter days), haematoma (9.33%) and guide wire kinking (7.66%). None of our patients developed immediate life threatening complications. Samir Hodzic et al reported a higher rate of complications when more than 2 attempts were used at CVC.<sup>[17]</sup>

**List of abbreviations:** CVC- Central Venous Catheterisation. CDC- Centre for Disease Control. IJV- Internal Jugular Vein. TBSA-Total Body Surface Area.USG- Ultrasonography.CLABI-Central Line Associated Bloodstream Infections. DVT- Deep Vein Thrombosis.

## CONCLUSION

We would like to emphasize that gaining reliable and safe IV access in a severe burns patient is of paramount importance. We recommend Femoral CVC placement over subclavian or jugular vein CVC, in acute severe burns as it is a reliable and safe technique, and we report no immediate life threatening complications by this route in our study. Medical simulation, better understanding and guided training of residents in controlled settings can further decrease the complication rates in the emergency settings.<sup>[18]</sup>

## REFERENCES

1. WHO Burns Fact sheet, September 2016; Retrieved from URL <http://www.who.int/mediacentre/factsheets/fs365/en/> (accessed on 20.11.15)
2. Guidelines for the Operation of Burn Units, Committee on Trauma, American College of Surgeons, Chicago, IL: American College Surgeons 1998; p 55–62.
3. O'Grady N.P., Alexander M., Dellinger E. P., Gerberding J. L., et al: Guidelines for the Prevention of intravascular catheter-related infections. Centers for Disease Control and Prevention 2002;1-26
4. Marik P. E., Flemmer M, Harrison W. The risk of catheter-related bloodstream infection with femoral venous catheters as compared to subclavian and internal jugular venous catheters: A systematic review of the literature and meta-analysis. Crit Care Med 2012;40(8):2479-85
5. Calvache J. A., Rodriguez M.V., Trochez A., Klimek M., Stalker R.J., et al. Incidence of Mechanical Complications of Central Venous Catheterization Using Landmark Technique. Journal of Intensive Care Medicine 2016; 31(6): 397-402.
6. Seldinger SI. "Catheter replacement of the needle in percutaneous arteriography: a new technique". Acta radiologica 1953; 39 (5): 368–76.
7. Lorente L, Henry C, Martín MM, Jiménez A, Mora ML. Central venous catheter-related infection in a prospective and observational study of 2,595 catheters. Critical Care. 2005; 9(6): 631-635.
8. Nagashima G, Kikuchi T, Tsuyuzaki H, Kawano R., Tanaka H., et al. To reduce catheter-related bloodstream infections: Is the subclavian route better than the jugular route for central venous catheterization. J Infect Chemother 2006; 12: 363–365.
9. Joynt G.M., Kew J., Gomersall C.D., Leung V.Y., Liu E.K. Deep venous thrombosis caused by femoral venous catheters in critically ill adult patients. Chest 2000; 117:178–183.
10. Parienti J., Thirion M., Mégarbane B., Souweine B., Ouchikhe A., et al. Femoral vs Jugular Venous Catheterization and Risk of Nosocomial Events in Adults Requiring Acute Renal Replacement Therapy: A Randomized Controlled Trial. JAMA. 2008; 299(20):2413–2422.
11. McGee D.C., Gould M.K. Preventing complications of central venous catheterization. N Engl J Med. 2003; 348: 1123-1133.
12. Bannon M.P., Heller SF., Rivera M. Anatomic considerations for central venous cannulation. Risk Management and Healthcare Policy 2011; 4: 27-39.
13. Boukatta, Brahim, El bouazzaoui, Abderrahim , Houari, et al. Accidental migration of a guidewire during femoral venous catheterization - A case report. Archives of Medicine 2014; 6 (1): 3.
14. Valero J., Barrerio J., Schez E., Vezquez G., Suso L.E., Martelo F. Central embolization by guidewire in a burn patient. Ann Burns Fire Dis 1996; 9: 142-144.

15. Han H.S., Jeon Y.T., Na H.S., Hwang J.Y., Choi E.J., Kim M.H. Successful removal of kinked J-guide wire under fluoroscopic guidance during central venous catheterization - A case report. *Korean Journal of Anesthesiology*. 2011; 60(5): 362-364.
16. Kusminsky RE. Complications of central venous catheterization. *J Am Coll Surg*. 2007; 204(4): 681–96.
17. Hodzic S, Golic D, Smajic J, Sijercic S, Umihanic S, Umihanic S. Complications Related to Insertion and Use of Central Venous Catheters (CVC). *Medical Archives*. 2014; 68(5): 300-303.
18. Bond W.F., Spillane L. The use of simulation for emergency medicine residents assessment. *Acad Emerg Med* 2002 Nov; 9(11):1295-9.

**How to cite this article:** Ali AM, Bharadwaj R, Faruqi NA. Landmark Based Femoral Central Venous Catheterization, A Reliable And Safe Method In Acute Burns Resuscitation: An Institutional Based Study. *Ann. Int. Med. Den. Res*. 2018; 4(4):MC01-MC04.

**Source of Support:** Nil, **Conflict of Interest:** None declared