

Original research article

# Feasibility of long saphenous vein cut down at sapheno-femoral junction for central venous access in neonates: A single centre experience of 3 years

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## Abstract

**Background:** Neonates pose a challenge in Neonatal intensive care unit (NICU) for central vascular access, which represents a daily practice. We have reported our experience with Central venous cut down through long saphenous vein (LSV) at sapheno-femoral junction (SF), its indications, feasibility and complications.

**Objective:** To assess the feasibility of insertion of central line by Sapheno-femoral (SF) cut down.

**Methods:** This is a retrospective study carried out in a Tertiary care hospital in a Metropolitan city of India. All the neonates who required Central venous access were included in the study.

**Results:** In our setting 176 neonates required LSV cut down for vascular access over a period of 3 years (2019-2022). The mean weight of the neonates was 1980 grams (range 680-4.1kg). The mean day at which the catheter was inserted was 7.1 days. Out of 176 neonates 8 neonates required vascular access for surgical condition and remaining 168 for medical condition. In 10 neonates the central line was inserted in operation theatre under general anaesthesia. In the remaining 166 neonates the catheter was inserted in NICU under local anaesthesia. The mean time required for insertion of catheter was 14.2 minutes. The most common indications for Central line insertion included Sepsis, Respiratory distress syndrome, prematurity. The complications of CVL in our setting were central line induced sepsis followed by limb oedema.

**Conclusion:** Open surgical cut down of long Saphenous vein is feasible and a safe procedure, It can be performed as a bedside procedure without the need for General anaesthesia.

**Key words:** Neonates, central venous access, long saphenous vein

## Introduction

Vascular access in a neonate is an important aspect of care. With advancement in medicine,

the survival rate of premature babies has increased. These neonates require long term care and hence the need of vascular access. Approximately 8.3-33% of neonates admitted to NICU require central venous access [1-4]. Central venous access can be obtained either by percutaneous technique or open method. In the following study we assessed the feasibility in terms of safety and complications.

## Methodology

A Retrospective study was conducted in a Tertiary care Hospital, Bengaluru. The neonates who underwent long saphenous vein cut down for vascular access between 2019-2022(3years) were included in the study. Ethical clearance was obtained from Institutional Ethical committee board before the start of study.

## Method

The requirement for central line was either due to medical or surgical causes. The neonates underwent procedure in either NICU or operating theatre. Those neonates who underwent the procedure in OT were administered general anesthesia (the indication of general anaesthesia was main surgical procedure). The neonates who underwent procedure in NICU were given local anaesthesia at the site and the neonate was held immobile by NICU staff. The right lower limb was preferred initially for all neonates. The thigh/leg was placed in partial abducted position. The thigh region was painted and draped (fig-1). Small transverse incision about 1cm was performed 1cm below and medial to the femoral artery pulsation at the inguinal ligament (fig-2). The subcutaneous tissue was dissected, the long saphenous vein identified, lifted, proximal and distal control of vein was achieved as shown in (fig-3). A venotomy was done, transecting less than 50% of the venous diameter and guidewire was introduced. The catheter (Leaderflex 22 gauge single lumen) was passed and the guidewire was withdrawn. Backflow of blood was confirmed. The distal suture was used to ligate the LSV and proximal suture was used to hold catheter in place. The catheter was fixed to the skin using mersilk 3'0 suture. The incision site was closed with mersilk 3'0 (fig-4). The line was routinely flushed with heparinized saline. In case of difficulty in accessing LSV on right side, the left LSV was catheterized in same setting.

## Results

In the study period of 3 years, 176 neonates required LSV cut down for vascular access. Out of 176, 98 were male and 78 were female babies. The mean weight of the neonates was 1980 grams (range 680-4.1kg). The mean day at which the catheter was inserted was 7.1 days (range 1-34days). Out of 176 neonates, 8 neonates required vascular access for surgical condition and remaining 168 for medical condition. In 10 neonates the central line was inserted in operation theatre under general anaesthesia. In the remaining 166 neonates the catheter was inserted in NICU under local anaesthesia (Table-1). The mean time required for insertion of catheter was 14.2 minutes. The mean duration of catheter in place was 8.09 days. Right LSV could not be cannulated in 10 neonates. In these neonates, left LSV was used for cannulation at the same setting. The most common indications for Central line insertion included Sepsis, Respiratory distress syndrome, and prematurity, followed by Seizures, birth asphyxia and jaundice (Table-2). The complications of Central venous access in our setting were central line induced sepsis followed by limb oedema. Sepsis was encountered in 12 out of 176 neonates (6.8%). In these neonates the central line was removed. Wound infection was seen in 5(2.8%) of neonates. Limb oedema was noted in 12 (6.8%) neonates, which can be attributed to the lymphatic channel disruption during insertion. The oedema settled with limb

elevation (Table-3). No cases of hematoma, catheter displacement, catheter blockage was noted in our study. No cases had Femoral artery or femoral vein injury. Procedure related mortality was zero. The catheter was removed on selective basis once the requirement of line was no more.

## Discussion

Vascular access in a neonate is an important requirement in functioning of NICU in a tertiary health care centre, with the advancement in medical facilities smaller and premature babies are surviving<sup>[5, 6]</sup>. Gaining vascular access in a neonate is a challenge. Central venous access help in repeated blood sampling, administration of hyperosmolar solution, resuscitation of shock where multiple drugs are required<sup>7</sup>. Most common veins for central venous access are internal jugular, femoral and sub-clavian veins. Very few studies have been published regarding LSV cut down at sapheno-femoral junction for central venous access in neonates.

Most of the cases in our study, the procedure was done in NICU with no sedation or general anaesthesia. This is an advantage compared to closed/Seldinger technique where General anesthesia is required. This reduces the risk involved in administering GA to neonate.

Few common difficulties faced in our technique were

- a) In extremely small babies, cannulation of the long saphenous vein with guide wire was a problem. This problem was addressed by increasing the venotomy diameter.
- b) In some cases, the guide wire did not pass through the sapheno-femoral junction into femoral vein. In these cases with repositioning of lower limbs made cannulation possible.

The common problems encountered in percutaneous techniques are Hematoma, Line displacement, Catheter malposition, leakage and catheter blockage<sup>[8]</sup>. In the Open cut down technique, the vein is visualized and venotomy done, following which the catheter is placed. Hence chances of the above mentioned complications are not encountered in open cut down procedure. The risk of complication increases with the number of attempts in close technique. Mc Gee and Gould reviewed CVC complications and found that the incidence of mechanical complications after three or more attempts was six times the rate of one<sup>[9]</sup>. Catheter induced sepsis in Closed technique vary from 0-46% in various studies<sup>[10, 11]</sup>. In our study 24 (13.6%) of the neonates went for complications which included catheter induced sepsis-6.6%. The rate of venous occlusion or thrombosis was 3% in our study which is comparable with the study by Khirallah *et al.* where occlusion rate was 3.3%.<sup>[12]</sup> Koksoy *et al.* reported 40% of venous thrombosis after Landmark technique and found that this was significantly associated with need for multiple punctures<sup>[13]</sup>. The success rate in achieving vascular access was 95.13% in our study which is comparable to study by Khirallah *et al.*<sup>[12]</sup>, Success rate in closed technique varies from 81-89% in Landmark technique and 94-100% in Ultrasound technique<sup>[14, 15]</sup>.

## Conclusion

Long saphenous vein cut down at the Sapheno-femoral junction for vascular access is safe procedure. It can be performed bed side in the NICU in an awake neonate with local infiltration of anaesthesia. It is very helpful procedure in neonates in whom vascular access is difficult. It is associated with lower complication rate therefore the above mentioned procedure is safe, easily reproducible.

## Results

Table 1

Variables		Observation(n=176)	Percentage
Neonates	Term	71	40.3
	Preterm	105	59.7
Weight of neonates	500-1000gm	14	8
	1000-1500gm	74	42
	1500-2500gm	65	37
	>2500 gm	23	13
Gender	Male	98	55.6
	Female	78	44.4
Site of insertion	Right sapheno-femoral	166	94.3
	Left sapheno-femoral	10	5.7
Indications	Medical	168	95.4
	Surgical	08	4.6
Type of anaesthesia	Local (Bedside)	166	94.3
	General anaesthesia	10	5.7

Table 2: Indications for central line (n=176)

Indications	Observations	Percentage
Sepsis	95	54
RDS	30	17
Severe prematurity	16	9.1
Seizures	09	5.1
Birth asphyxia	09	5.1
Jaundice	09	5.1
Surgical*	08	4.6

\*CDH, TOF, Atresia, Hirschsprungs-surgical causes

Table 3: Complications of Sapheno-femoral cut down

Complications(n=24)	Observations(*Multiple response)
Sepsis	12
Wound infection(superficial)	05
Limb oedema	12
Venous thrombosis	06



Fig 1



Fig 2



Fig 3

Fig 4

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