

# **Venous Access in Children**

*An essay*

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General Surgery*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا  
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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# Contents

List of abbreviations .....	i
List of tables .....	iii
List of figures .....	iv
<b>Introduction and Aim of the Work .....</b>	<b>1</b>
<b>Chapter (1):</b>	
* Anatomy of common sites of veins for venous access..	4
<b>Chapter (2):</b>	
* Types of venous access .....	16
<b>Chapter (3):</b>	
* Indications and contraindications .....	31
<b>Chapter (4):</b>	
* Equipments.....	36
<b>Chapter (5):</b>	
* Procedures and methods of insertion .....	39
<b>Chapter (6):</b>	
* Complications & management of the venous access .....	90
<b>Summary .....</b>	<b>112</b>
<b>References .....</b>	<b>114</b>
<b>Arabic Summary .....</b>	<b>--</b>

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## List of Abbreviations

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ACT	: Activated clotting time
AV	: Atrioventricular
CA	: Carotid artery
CoNS	: Coagulase negative Staphylococcus aureus
CPR	: Cardiopulmonary resuscitation
CRBSI	: Catheter related blood stream infection
CT	: Computed tomography
CVAD	: Central venous access devices
CVC	: Central venous catheters
CXR	: Chest X-ray
DVT	: Deep venous thrombosis
ED	: Emergency department
EJV	: External jugular vein
ICU	: Intensive care unit
IJV	: Internal jugular vein
IM	: Intramuscular
INR	: International normalized ratio
IO	: Intraosseous
IP	: In-plane
IV	: Intravenous
IVC	: Inferior vena cava
LA	: Local anesthetic
Mm	: Melli meter
MRSA	: Methicillinase resistant staph aureus
MSB	: Maximal sterile barrier
NICU	: Neonatal intensive care unit
OD	: Outer diameter
OOP	: Out-of-plane
PICC	: Peripherally inserted venous catheters
PT	: Prothrombin time
PTT	: Partial thromboplastin time
PVC	: Polyvinyl chloride

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## **List of Abbreviations (Cont.)**

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RA	:	Right atrium
SCM	:	Sternocleidomastoid
SV	:	Subclavian vein
SVC	:	Superior vena cava
TAD	:	Transparent adhesive dressing
TIVADs	:	Totally implantable venous access devices
TPN	:	Total parenteral nutrition
US	:	Ultrasound
VAD	:	Venous access devices

## List of tables

<i><b>Table</b></i>	<i><b>Title</b></i>	<i><b>Page</b></i>
1	A summary of the features of the different infusion sites	35

## List of Figures

<b><i>Fig.</i></b>	<b><i>Title</i></b>	<b><i>Page</i></b>
1	Venous access sites in the neonate and young infant	4
2	Femoral vein anatomy	7
3	Anatomy of the subclavian and internal jugular veins	8
4	Subclavian vein anatomy	10
5	Internal jugular vein anatomy	12
6	Anatomical variation of IJV relation to carotid artery	12
7	Algorithm for venous access in children	17
8	PICC set: a-catheter, b-trocar, c-guidewire, d-scalpel, e-peel away cannulae	19
9	Non tunneled catheter	22
10	Skin tunneled catheter	24
11	Tunneled catheter	24
12	Implantable ports	26
13	Huber needle (non coring)	26
14	Intraosseous venous access	27
15	Technique for peripheral venous catheterization	45
16	Position of the needle in the “in-plane” (left) and “out-of-plane” (right) techniques	50
17	Transverse US scan of internal jugular vein (IJV) and carotid artery (CA) -right side	51
18	Longitudinal US scan of internal jugular vein.(IJV)-right side	51
19	Technique for internal jugular venous catheterization	54



## List of Figures (Cont.)

<b><i>Fig.</i></b>	<b><i>Title</i></b>	<b><i>Page</i></b>
20	Transverse US scan appearance of carotid artery and internal jugular vein	56
21	Blind technique of CVC introduction in subclavian vein	58
22	Blind technique of CVC introduction in femoral vein	59
23	Transverse ultrasound image of the right common femoral vein (CFV) and artery (CFA)	61
24	Procedural steps for venous cutdown	62
25	mini-cutdown technique	63
26 a	The vein is transected ventrally and microsurgery forceps are used to enlarge the vein	65
26 b	The catheter is inserted and advanced into the vein. The proximal suture is tractioned to avoid venous back-bleeding	65
27	A chest film shows the proper catheter tip placement via the left IJ vein in the superior vena cava ( <i>arrow</i> )	75
28	a Port chamber is sutured to the fascia. b When the skin is released the port should not be visible in the middle of the incision	80
29	Diagram of Huber needle puncture of the implanted port	81
30	Umbilical vein catheterization	85
31	Intraosseous venous access	87
32	Use of a Spring-Loaded Device or a Drill-Assisted Device	88
33	Significant heamorrhage after puncture of femoral artery	100

## **Introduction**

Nothing can be more difficult, time consuming and frustrating than obtaining vascular access in the paediatric patient. This was best described by Orłowski in 1984, who stated, ‘My kingdom for an intravenous line (Nikolaus, 2004).

Difficulty in placing a peripheral intravenous line is a very common and frustrating experience (Laura, et al., 2009).

Conventional peripheral intravenous (IV) lines are simple, inexpensive, and can be used for short-term IV therapy. Veins are typically accessed in the patient’s hand or arm, and sometimes in the foot (Cheung, et al., 2009).

Nurses encounter children with peripheral difficult vascular access (DVA) on a daily basis. Early identification of patients with potential DVA gives time to adjust approach and use special techniques that enhance venous access and improve cannulation success rates. If venous access cannot be achieved after 2 to 4 attempts, alternative routes of administration should be considered (Laura, et al., 2009).

Increased awareness, coupled with better management of DVA, should minimize its immediate and longterm impact on the child, family, and health care provider (Laura, et al., 2009).

Percutaneous central venous line insertion has replaced peripheral venous cut down as the primary mode of short term venous access in childhood. Venous cut down is regarded as

the method of last resort, but remains useful in emergency situations when other attempts at venous access have failed (*Nikolaus, 2004*).

Central lines can be classified as either peripherally inserted or centrally inserted central devices (*Cheung, et al., 2009*).

The Central venous catheter can be inserted into the femoral, jugular and subclavian veins, or other influent veins, and in most cases catheter insertion is feasible (*Nikolaus, 2004*).

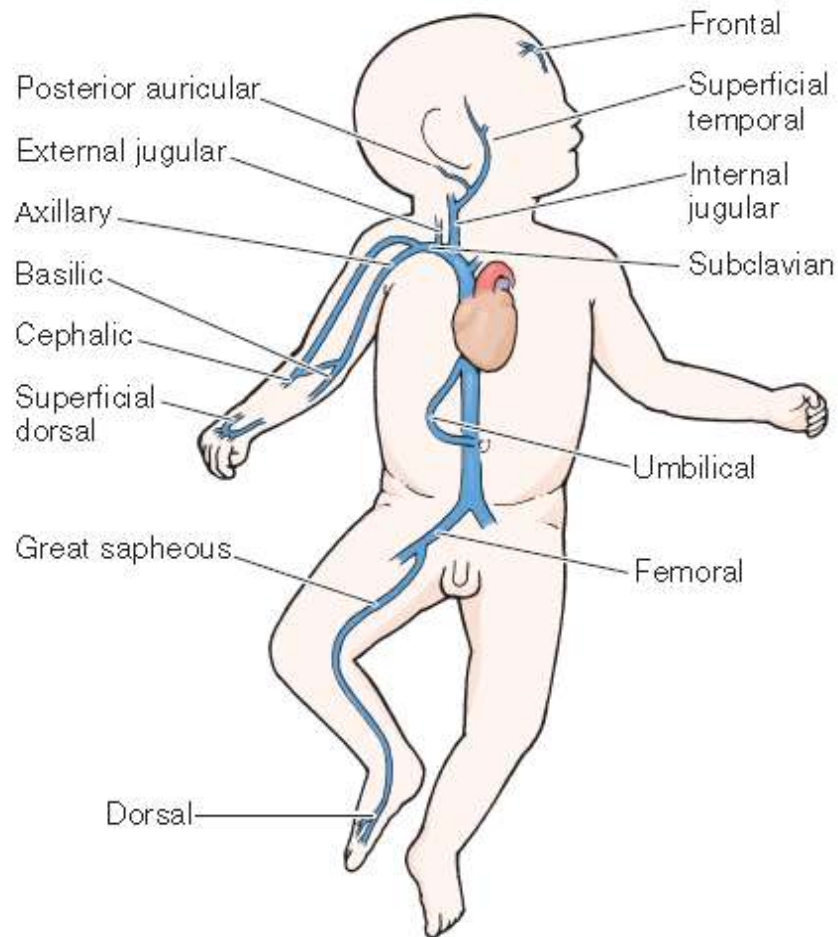
The Intra Osseous (IO) route provides rapid and reliable access to the systemic venous circulation in the pediatric population. This technique is safe, complications are infrequent and the benefits clearly outweigh the risks, especially in the pediatric population (*Nikolaus, 2004*).

Arterial puncture, hematoma, and pneumothorax are the most common mechanical complications during the insertion of central venous catheters. The catheter could be changed over a guide wire. This technique reduces the number of insertion-related complications and is safe, even in patients with sepsis, as long as antibiotic therapy has been initiated. In patients who have septic shock and no other source of infection, the catheter should be removed and replaced with a new one at a new site (*McGee and Gould, 2003*).

## **Aim of the Work**

The aim of this essay was to review the classic and recent modalities of vascular access as regard its types, devices, indications, complications, and their managements.

## Anatomy of Veins Usually used for Venous Access



**Fig. (1):** Venous access sites in the neonate and young infant (*Lozon M, 2012*).

## **1- Extremities:**

### **A- Upper extremity:**

#### ***Cephalic and Basilic***

Cephalic and basilic veins are the superficial veins of the arm. Basilic vein is the largest arm vein measuring 6-8 mm. It passes along the medial (ulnar) aspect of the arm from wrist to shoulder. It begins at the dorsum of the hand, crosses the elbow and drains into the brachial vein (*Last, 2003*).

Cephalic vein, measuring 4-6mm, runs along the lateral (radial) aspect of the arm also from the wrist to shoulder emptying into the axillary vein (*Last, 2003*).

Although the basilic vein is larger, the cephalic vein is more superficial and easier to dissect out. Therefore it is often the preferred vein for dialysis fistulas or grafts. Conversely, the cephalic vein may take an acute angle before it enters the axillary vein sometimes making negotiation with a catheter or wire difficult (*Andrews et al., 1992*).

#### ***Median antecubital vein***

Oblique coursing vein at the elbow that joins the basilic and cephalic veins (*Last, 2003*).

#### ***Deep forearm veins***

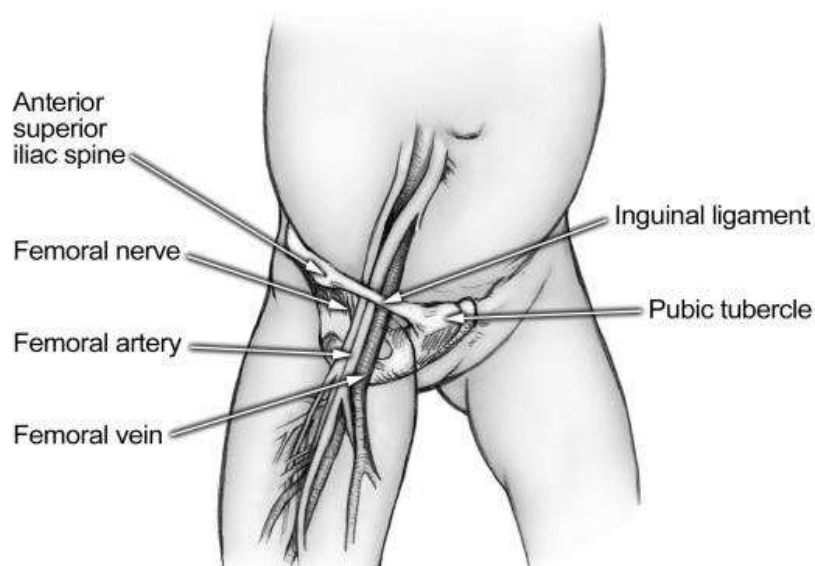
These are 2 or 3 veins each that course with and are named like the corresponding arteries of the forearm (radial & ulnar). Brachial veins are the deep veins of the upper arm, usually paired and smaller than the superficial veins. They

travel in the upper arm parallel to (on either side) the brachial artery and join with the basilic vein to form the axillary vein (*Last, 2003*).

***B-Lower extremity:***

***Femoral Vein***

The femoral vein is the continuation of the popliteal vein beginning at the adductor hiatus. It receives the greater saphenous vein and the deep femoral vein. It continues as the external iliac vein at the inguinal ligament. It usually lays posterolaterally to the femoral artery in the thigh and then moves medially at the groin. In approximately 25% of people the femoral vein is directly posterior to the artery at the groin. Traditionally, femoral veins are not routinely used for venous access except on an acute temporary basis or when all other sites have been exhausted (*Hartnett et al., 1996*).



**Fig. (2): Femoral vein anatomy (*Putigna, 2011*)**