GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

GAVePed
Gruppo Accessi Venosi Pediatrici

II Convegno
GAVePed
Covegno del Gruppo Accessi Venosi Pediatrici

Accesso per procedure aferetiche in età pediatrica

Daniele G. Biasucci, M.D.

Fondazione Policlinico Universitario "A. Gemelli"

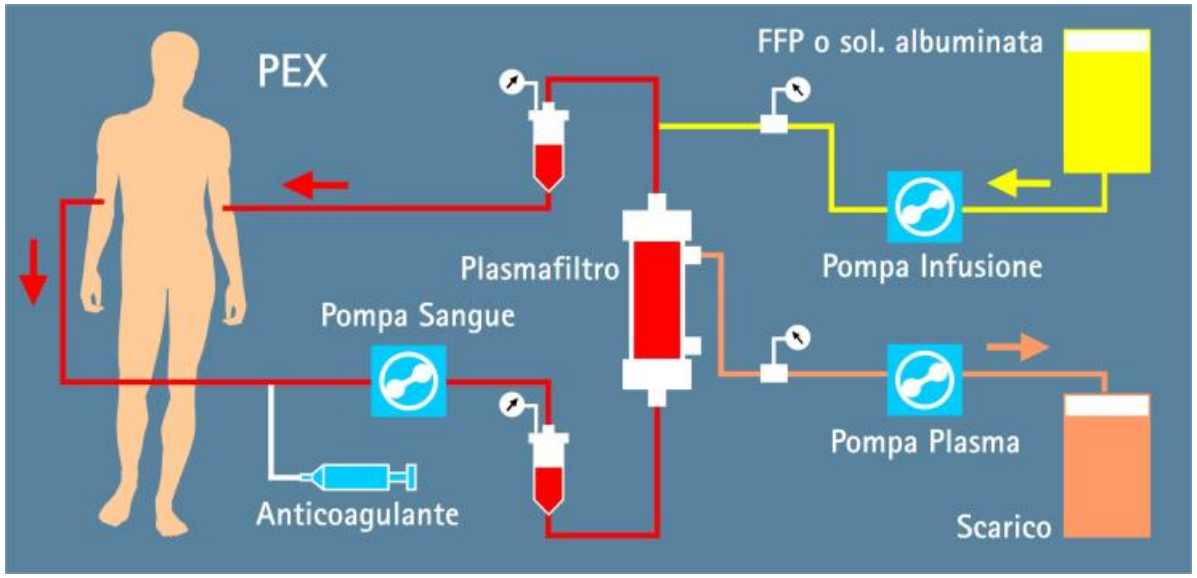
Università Cattolica del Sacro Cuore di Roma

EcoTIME
Ecografia in Terapia Intensiva e Medicina dell'Emergenza

Gemelli

Fondazione Policlinico Universitario A. Gemelli
Università Cattolica del Sacro Cuore

Aferesi Terapeutica



- Il plasma viene separato dalla componente cellulare
- Il plasma del paziente è sostituito da una soluzione albuminata o da PFC

Aferesi Terapeutica

- Per rimuovere il 75% di una noxa patogena, durante una procedura si dovrebbe scambiare 1.4 volte il VP
- Questo volume non deve essere inferiore al VP del paziente

Flussi

- Adulti
  - aferesi periodica: durata seduta 3-4 ore
  - generalmente da 40 fino a 80 ml/min
  - talvolta fino a 100 – 120 ml/min
- Bambini
  - 1 ml/kg/min, generalmente 15-30 ml/min

Diverse situazioni cliniche

- Procedure singole o comunque ‘acute’
  - Accessi venosi messi e tolti in occasione della seduta
- Procedure ripetute, ovvero ‘croniche’ periodiche
  - Necessità/utilità di un accesso venoso cronico stabile

VAD adeguato

- Durata del trattamento?
  - Parliamo di aferesi cronica → lunga durata
- Quante sedute?
  - parliamo di aferesi periodica → uso discontinuo
- Il paziente ha necessità di altre terapie infusionali?
- Dovrà andare a casa con quel catetere?

VAD adeguato

- Un catetere venoso centrale stabile che duri nel tempo e che assicuri la performance richiesta è fondamentale per il successo dell'aferesi terapeutica
- E' fondamentale la scelta del VAD
  - Uso discontinuo
  - Medio-termine
- E' fondamentale la tecnica di impianto!
  - Corretto posizionamento della punta

Diverse opzioni di accesso vascolare

- Cateteri venosi periferici vs. centrali
- Accessi per aferesi ‘acuta’ vs. ‘cronica’
- Accessi inconsueti per aferesi a tempo indeterminato (anni)
  - Fistole AV, graft AV, port bilume

VAD ‘ideale’ per AT

- Doppio lume
- Catetere a medio-termine
- Utilizzo discontinuo
- Possibilità di flussi adeguati
- Basso rischio di ostruzione
- Lunghezza minima
  - per ridurre le resistenze
  - per permettere al sangue intero di mescolarsi con citrato il più rapidamente possibile durante il prelievo

Letteratura ?... scarsa

- Poche review
- Quasi nessun documento evidence-based (consensus o linea guida)
- Molte '*experts opinions*'

2012

Journal of Clinical Apheresis 27:153–159 (2012)

The Choice of Vascular Access for Therapeutic Apheresis

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Division of Nephrology, University of Virginia Health System, Charlottesville, Virginia

Therapeutic apheresis (TA) is performed using either centrifugation-based or filter-based systems. The blood flow rate (BFR) used for TA using centrifugation-based systems is less than 100 mL/min. Because of this low BFR requirement, even peripheral veins can be considered as an option for TA, especially for less-frequent treatments and those performed for short periods. Other options for vascular access (VA) include central venous catheters (temporary or tunneled), totally implantable ports, and arteriovenous fistulae (AVF) or grafts (AVG). Nontunneled catheters should be considered as the choice of VA for relatively short-term treatments mainly in the inpatient settings. For long-term treatments, ports and tunneled catheters should be considered because of lower rates of infections compared to nontunneled catheters. However, studies in hemodialysis (HD) patients have demonstrated significantly higher morbidity and mortality rates associated with the use of tunneled catheters as compared to AVF. Therefore, if TA is being considered for several years, AVG and AVF would be the preferred options of VA. Studies in HD population indicate far better outcomes with the use of AVF as compared to AVG. This article, as presented at the Therapeutic Apheresis Academy in September 2011, is an overview of the available VA options for TA based on indication and duration of treatment. Pros and cons of each option are mentioned briefly. Finally, for those considered for AVF placement for chronic TA, specific recommendations are made for the care of AVF based on our own experience at University of Virginia. J. Clin. Apheresis 27:153–159, 2012.

Key words: vascular access; therapeutic apheresis; catheter; arteriovenous fistula; arteriovenous graft

TABLE II. Option of Vascular Access for TA

Access Type	Use
Peripheral Vein	Short-term, less frequent and shorter treatments, large veins
Nontunneled CVC	Short-term treatments, filter-based and centrifugation-based systems
Tunneled CVC	Long-term (weeks to months) treatments, filter-based and centrifugation-based systems
Totally implantable ports	Long-term (weeks to months) treatments, filter-based and centrifugation-based systems
AVF	Long-term (years) treatments

Kalantari 2012

2012

Seminars in Dialysis

THERAPEUTIC APHERESIS FOR NEPHROLOGISTS

Therapeutic Apheresis in Children: Special Considerations

Stuart L. Goldstein

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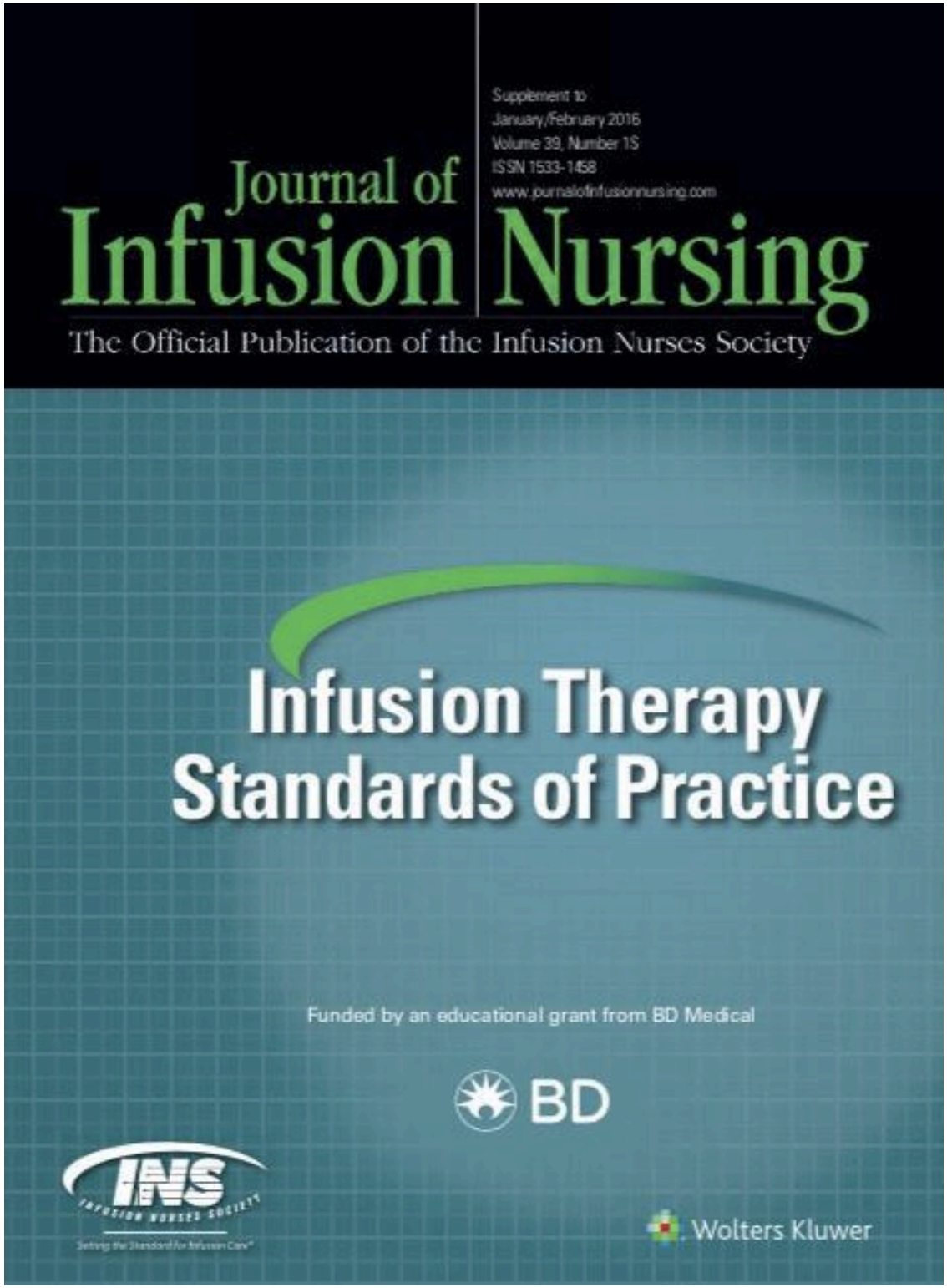
ABSTRACT

The provision of therapeutic apheresis to children is a technically challenging procedure, requiring trained personnel and an understanding of the disease processes that leads to the need for apheresis. Most apheresis protocols are derived from studies in adult patients, even though most studies are of limited sample size. The focus of this review is to highlight the disease processes commonly treated with therapeutic apheresis in children, and to address the technical considerations pertinent to the provision of safe and effective apheresis in the pediatric setting.

TABLE 3. Suggested size and selection of vascular access for pediatric patients

Patient size	Catheter size; source
Neonate	Dual-lumen 7.0; French
3–6 kg	Dual-lumen 7.0; French
	Triple-lumen 7.0; French
6–30 kg	Dual-lumen 8.0; French
> 15 kg	Dual-lumen 9.0; French
> 20 kg	Dual-lumen 10.0; French
> 30 kg	Triple-lumen 12; French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Wolters Kluwer

2016

B. Peripheral or central VADs are recommended for therapeutic apheresis as follows:
   1. Use of 16- to 18-gauge peripheral catheters placed in antecubital veins for adults. Peripheral vein access is not recommended in young children (< 30 kg) due to small veins but may be possible with older children and adolescents. Peripheral veins are not appropriate for filter-based apheresis systems.[1-5] (IV)
   2. Use a nontunneled or tunneled cuffed central VAD with a catheter size of at least 11.5 Fr for adults.[1-3] (IV)
   3. Implanted vascular access ports are used less commonly.[1-4] (IV)
   4. Peripherally inserted central catheters should not be used for therapeutic apheresis due to small internal diameters and inability to accommodate blood flow rates.[3] (IV)
   5. Arteriovenous (AV) fistulae and AV grafts may be placed for long-term treatment.[1-3] (IV)

2018

REVIEW

Cellular collection by apheresis

Anand Padmanabhan

TRANSFUSION Volume 58, February 2018

Access type	Setting
Peripheral veins	Adequate veins; one or few procedure(s) anticipated
Non-tunneled CVCs	Veins not adequate; one or few procedure(s) anticipated
Tunneled CVCs	Veins not adequate; several procedures anticipated; potential long-term (weeks/months) use (e.g., for chemotherapy)
Port-CVCs	Veins not adequate; several procedures/weeks-months of access anticipated

Padmanabhan 2018

Consideriamo le diverse opzioni

- Catetere venoso periferico + catetere venoso periferico
- Catetere venoso periferico + catetere venoso centrale
- Catetere venoso centrale + catetere venoso centrale
- Catetere venoso centrale bilume a breve termine
- Catetere venoso centrale bilume a lungo termine
  - Tunnellizzato/cuffiato
  - port
- Fistola artero-venosa (o graft)

Cateteri venosi periferici

- **Agocannule**
  - Lunghezza < 6cm
  - 26G - 24G - 22G - 20G (3Fr) - 18G (4Fr) - 16G - 14G
- **Cannule periferiche lunghe (mini-midline)**
  - Lunghezza 6-15 cm
  - 3Fr - 4Fr
- **Cateteri midline**
  - Lunghezza 15-25 cm
  - 3Fr - 4Fr - 5Fr

Cateteri venosi periferici

- **Caratteristiche che influenzano la performance in termini di flusso**
  - Materiale
    - Silicone, PUR, PTFE, PEBA, PE
  - Calibro
  - Lunghezza
  - Posizione della punta
  - Presenza di valvole (Groshong)

Flusso delle agocannule

- Calibro: adeguato se > 18G
- Materiale: adeguato (PTFE o PUR)
- Lunghezza: adeguata (< 6cm)
- Ma la punta deve essere posizionata in vena con flusso adeguato

Flusso dei mini-midline

- Calibro: adeguato se > 3Fr
- Materiale: adeguato (PUR o PEBA o PE)
- Lunghezza: eccessiva (> 6cm)
- Ma la punta deve essere posizionata in vena con flusso adeguato

Flusso dei midline

- Calibro: adeguato se > 3Fr
- Materiale: adeguato soltanto se PUR o PEBA (inadeguato il silicone)
- Lunghezza: eccessiva (> 15cm)
- Design: inadeguato se il catetere è valvolato
- Punta di solito posizionata in vena con flusso adeguato

Quali CVP per prelievo?

- **Cannule corte di largo calibro, in PUR o PTFE, posizionate in vene con flusso adeguato**

Ovvero:

- Agocannule 18G o 16G o 14G in vene periferiche del braccio
  - In vene superficiali visibili/palpabili (puntura e incannulazione diretta)
    - Vena antecubitale, vena cefalica, vena basilica
  - In vene profonde (puntura e incannulazione ecoguidata)
    - Vena basilica, vene brachiali

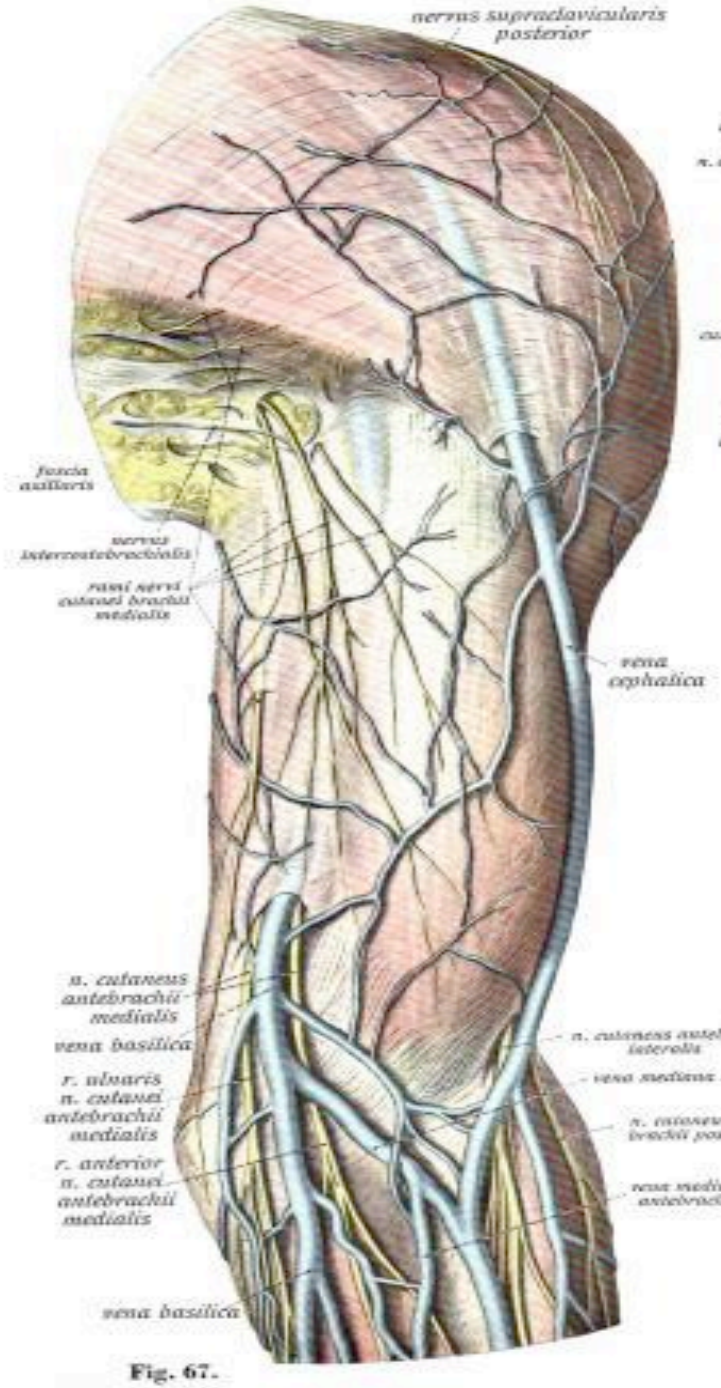
nervus supraclavicularis posterior
fascia axillaris
nervus intercostobrachialis
rami nervi cutanei brachii medialis
vena cephalica
n. cutaneus antebrachii medialis
vena basilica
r. ulnaris n. cutanei antebrachii medialis
r. anterior n. cutanei antebrachii medialis
vena basilica
n. cutaneus antebrachii lateralis
vena mediana cubiti
n. cutaneus antebrachii posterior
vena mediana antebrachii

Fig. 67.

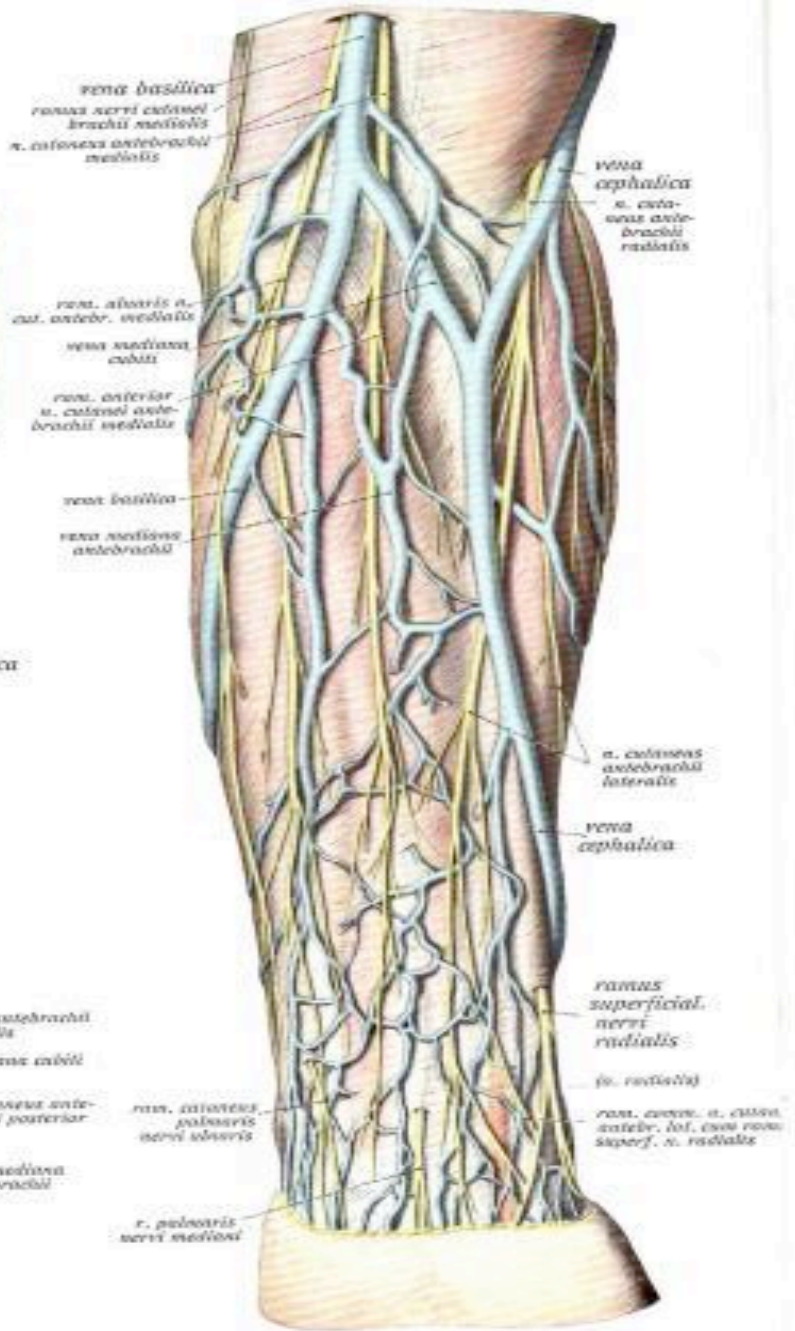
vena basilica
ramus nervi cutanei brachii medialis
n. cutaneus antebrachii medialis
vena cephalica
n. cutaneus antebrachii radialis
ram. ulnaris n. cut. antebr. medialis
vena mediana cubiti
ram. anterior n. cutanei antebrachii medialis
vena basilica
vena mediana antebrachii
n. cutaneus antebrachii lateralis
vena cephalica
ramus superficialis nervi radialis
(n. radialis)
ram. cutaneus palmaris nervi ulnaris
ram. cutan. n. cutan. antebr. lat. (sub ram. superf. n. radialis
r. palmaris nervi medialis

Fig. 68.

Venipuntura ecoguidata

- La metodica migliore per accedere a vene di calibro adeguato, più o meno in qualunque paziente
- Infatti: la maggioranza dei pazienti candidati ad aferesi (60%?) = **DIVA**
- N.B.: la durata delle agocannule posizionate per via ecoguidata è di solito <24h: vanno posizionate ex novo ad ogni procedura aferetica

Consensus SIDEM-GITMO 2011

- *"….When peripheral venous accesses are not feasible or appropriate (…..), a CVC should be placed."*
- L'uso della ecoguida però può ridurre in modo rilevante il ricorso al CVC.

2015

Journal of Clinical Apheresis 30:380–381 (2015)

Letter to the Editor

Deep Vein Puncture Under Ultrasonographic Guidance—An Alternative Approach for Vascular Access of Apheresis Therapies

Norio Hanafusa,[1,2]* Toshihiro Torato,[1] Daisuke Katagiri,[1] Tomoko Usui,[1] Akihiko Matsumoto,[1] Eisei Noiri,[1] and Masaomi Nangauku[1]

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2015

Journal of Clinical Apheresis 00:00–00 (2015)

Ultrasound-Guided Peripheral Deep Vein Cannulation to Perform Automated Red Cell Exchange—A Pilot Study in a Single Centre

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Background: Securing adequate vascular access is essential for a successful apheresis procedure. In most, peripheral access is preferred but it is not always technically possible. Ultrasound-Guided Peripheral Vascular Access (USG-PIVA) is a well-documented technique in the setting of Emergency departments. However, limited data exists reporting its use in the context of automated red cell exchanges (a-RCEx). **Purpose:** To assess the effectiveness and feasibility of USG-PIVA to undertake successful a-RCEx. **Methods:** Data was collected prospectively from patients with sickle cell disease and difficult venous access, undergoing a-RCEx at a single centre. The USG-PIVA technique was attempted and data relating to each attempt was collected and analysed. **Results:** Between April 2014 and July 2015 84 USG-PIVA procedures were performed on 38 patients. 71 USG-PIVA (85%) were successful, 13 (15%) were unsuccessful. Veins successfully cannulated: in the upper arm, basilic (22), brachial (33) and cephalic (2) veins; in the antecubital fossa, basilic (3) and median cubital (7) and in the lower arm, cephalic (2) and radial (2). Cannulas used: Introcan Safety® Braun 22 g (1), 20 g (9) and 18 g (61). Inlet flow rates achieved: 30–60 ml/min (mean 45 ml/min). Depth of veins cannulated: 2–12 mm (mean 5 mm). two complications were observed—one cannula displacement and one nerve injury. No arterial punctures occurred. Central Venous Catheters avoided (49). **Conclusion:** The US-PIVA method offers an effective alternative to Central Venous Access in patients requiring a-RCEx procedures who lack visual or palpable peripheral access, with minimal complications seen in this series. J. Clin. Apheresis 00:000–000, 2015.

Key words: ultrasound-guided peripheral venous access; erythrocytapheresis; sickle cell disease; apheresis

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2016

RESEARCH ARTICLE

WILEY Journal of Clinical Apheresis ASFA

Ultrasound-guided peripheral venous access for therapeutic apheresis procedures reduces need for central venous catheters

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Abstract

Therapeutic and donor apheresis requires adequate vascular access to achieve inlet flow rates of ~50—100 mL/min. While central dialysis-type venous catheters can usually provide such access, their use includes several associated risks. Some of these risks can be avoided or diminished if adequate peripheral venous access can be established. Some patients have adequate peripheral veins for apheresis that cannot be readily identified visually or by palpation. We hypothesized that ultrasound-guided peripheral venous access would benefit such patients and would lead to placement of fewer central venous catheters. The technique of ultrasound-guided peripheral access for apheresis has been in use at Houston Methodist Hospital since 2012. We performed a prospective review of patients undergoing inpatient and outpatient apheresis at Houston Methodist Hospital from July 1, 2015 to September 30, 2015, to assess its benefit. During this time, we performed 831 procedures on 186 patients, including 787 therapeutic plasma exchanges, three red blood cell exchanges, 41 peripheral stem cell collections. Ultrasound-guided vascular access was used for 68 procedures (8% of all procedures), including 62 therapeutic plasma exchanges, 4 peripheral stem cell collections, and 2 red blood cell changes. Use of ultrasound-guided peripheral access prevented the placement of central venous catheters in 37 (20%) patients, demonstrating its utility in a busy transfusion service.

2017

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RESEARCH ARTICLE

WILEY Journal of Clinical Apheresis ASFA

A successful model to learn and implement ultrasound-guided venous catheterization in apheresis

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Background: Apheresis treatments can be performed with peripheral venous catheters (PVC), although central venous catheters (CVC) are inserted when PVCs fail or patient with history of difficult vascular access prior to the apheresis. Ultrasound guidance for PVC has shown promising results in other settings.

Purpose: To investigate if ultrasound guidance for PVC could be implemented among apheresis nurses. Second, how implementation of ultrasound guidance affected the number of CVCs used for apheresis per patient.

Quali CVP per reinfusione?

- Qualunque cannula corta di calibro >20G
- Qualunque cannula periferica lunga > 3Fr
- Qualunque catetere midline > 3Fr

Cateteri venosi centrali

Cateteri venosi centrali

- **Classificati secondo sito di inserzione**
  - CICC – in vene della regione sopra/sottoclaveare
  - PICC – in vene del braccio
  - FICC – in vene della regione inguinale
- **Classificati secondo caratteristiche di impianto**
  - Cateteri non tunnellizzati
  - Cateteri tunnellizzati non cuffiati
  - Cateteri tunnellizzati cuffiati
  - Sistemi totalmente impiantabili (port)

Cateteri venosi centrali

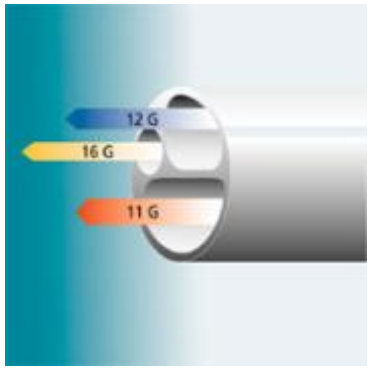
- Caratteristica strutturale che può essere utile
  - Monolume/bilume
- Altre caratteristiche che influenzano sulla performance in termini di flusso:
  - Calibro esterno (Fr)
  - Calibro di ciascun lume interno (G)
  - Lunghezza
  - Materiale
  - Presenza di una valvola
  - Posizione della punta
  - Percorso rettilineo/curvilineo del catetere
  - Presenza di un reservoir

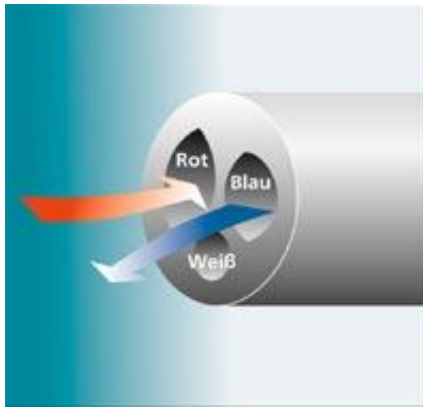
Numero dei lumi

- La presenza di un catetere venoso centrale bilume consente di avere una via di prelievo e una via di infusione nello stesso dispositivo

Calibro e lunghezza

- La resistenza al flusso è direttamente proporzionale alla lunghezza a inversamente proporzionale al calibro
  - Diametro esterno in French (1Fr = 0,33 mm)
  - Area interna in Gauge (20G = 1/20 cm2)
- Catetere lungo = alta resistenza
- Calibro piccolo = alta resistenza
- Nel caso dei cateteri bilume, conta il calibro interno (G) ma anche la forma del lume



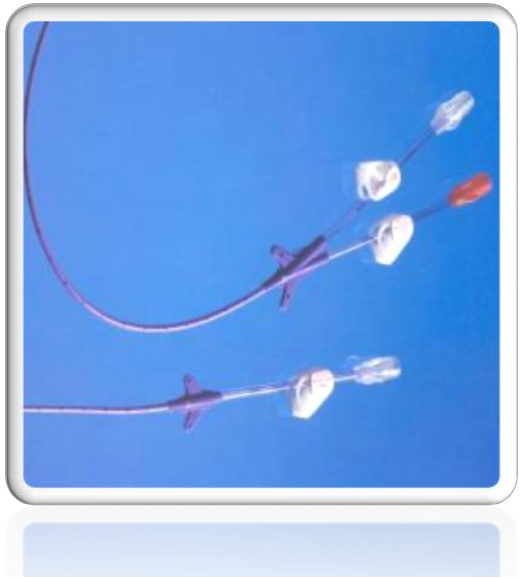


Materiale

- I flussi maggiori si hanno con il PUR (meno fragile e meno collassabile del silicone), specialmente se nell'ambito di dispositivi power injectable
  - Evitare i cateteri in silicone, come criterio generale
- I cateteri in silicone possono essere adatti alla reinfusione, più difficilmente al prelievo
  - Mai utilizzare Broviac, Hickman, etc. per prelievo!
- La presenza di una valvola distale (Groshong) o prossimale (SOLO 2 o PASV) aumenta la resistenza e rende il catetere inadatto al prelievo
  - Mai utilizzare Groshong per prelievo!

Power Injectability

Caratteristica tecnica di un **device intravascolare**, le cui specifiche costruttive lo rendono **resistente ai possibili danni strutturali** derivanti **dall'iniezione di fluidi ad elevata pressione**



Posizione della punta

- Una punta in atrio destro o nel punto più largo della vena cava inferiore assicura maggior flusso che una punta che ‘va a parete’ contro la cava
- Cfr. cateteri per dialisi (!)
  - Per i CICC per dialisi, la posizione ideale per la punta del lume distale è l’atrio destro

Percorso rettilineo/curvilineo del catetere

- In un catetere non ‘curvato’, un tragitto curvilineo intravascolare o sottocutaneo o extracutaneo riduce il flusso
- Un angolo di 90° riduce il flusso del 40%

Presenza di un reservoir

- Il reservoir del port aumenta la resistenza al flusso (due stenosi – ago di Huber e raccordo reservoir-catetere – con in mezzo un sito caratterizzato da flusso turbolento)
- Alcuni reservoir sembrerebbero avere un flusso meno turbolento (sistema ‘ vortex’)

Quali CVC per prelievo?

- **CVC monolume non valvolati, di calibro adeguato, preferibilmente con punta in atrio destro o in piena cava inferiore, sufficientemente corti, con tragitto rettilineo**

Oppure:

- **CVC bilume non valvolati di grosso calibro, preferibilmente con punta in atrio destro o in piena cava inferiore, con tragitto rettilineo o eventualmente precurvati**

Quali CVC per reinfusione?

- Praticamente qualunque CVC di qualunque tipo

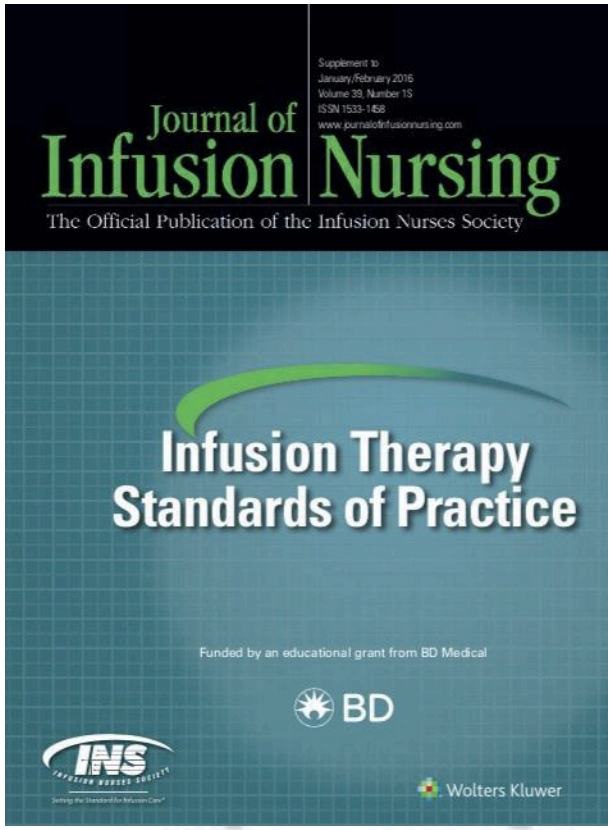
In altre parole…

- Il vero problema è il prelievo, non la reinfusione
- Non tutti i dispositivi consentono un prelievo adeguato (materiale, calibro e lunghezza influiscono)
- Anche l'apparecchio per feresi ha il suo ruolo (limite: gli apparecchi sono settati per bloccarsi su valori di pressione assai bassi)

Opzioni cliniche

Opzione CVP + CVP

- Il CVP per prelievo dovrà essere inserito ex novo: posizionata in vene con flusso adeguato, eventualmente per via ecoguidata
- La seconda via (reinfusione):
  - Agocannula inserita ex novo
  - Mini-midline già in sede e ben funzionante (>3Fr)
  - Catetere midline già in sede e ben funzionante (>3Fr)



2016

Use of 16- to 18-gauge peripheral catheters placed in antecubital veins for adults. Peripheral vein access is not recommended in young children (< 30 kg) due to small veins but may be possible with older children and adolescents. Peripheral veins are not appropriate for filter-based apheresis systems.[1-5] (IV)

2016

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COMMENTARY

WILEY Journal of Clinical Apheresis ASFA

Is peripheral access for apheresis procedures underutilized in clinical practice?—A single centre experience

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Abstract

Background: The majority of reports regarding general vascular access choices for apheresis procedures argue that peripheral venous access should be considered first. However, the clinical reality appears to be different. While some procedures mandate central vascular access (e.g., therapeutic apheresis procedures in critically ill patients) and in some cases it is the patient's preference, we propose that the majority of elective procedures can be successfully performed peripherally.

Purpose: To establish the feasibility and suitability of peripheral access for different apheresis procedures, undertaken in elective or emergency settings.

Opzione CVP + CVC

- Il CVP per prelievo dovrà essere inserito ex novo: posizionata in vene con flusso adeguato, eventualmente per via ecoguidata
- La seconda via (reinfusione):
  - Qualunque CVC già in sede:
    - CICC, PICC o FICC
    - Tunnellizzato o non tunnellizzato

Opzione CVC + CVC

- Nella impossibilità di posizionare un CVP, si può posizionare un CVC monolume, di calibro adeguato, sufficientemente corto, con buon flusso (FICC o CICC) e usarlo per prelievo
- La seconda via (reinfusione):
  - Qualunque CVC già in sede:
    - CICC, PICC o FICC
    - Tunnellizzato o non tunnellizzato

Opzione CVC bilume non tunnellizzato

- Catetere ‘acuto’
- Dispositivi di prima scelta: **CVC bilume in PUR (o in SIL ‘armato’) destinati a procedure dialitiche, inseriti come CICC (punta in atrio destro) o FICC (punta in vena cava inferiore)**
- Da preferire i FICC piuttosto che i CICC ?
  - Risparmio vene distretto cava superiore
  - Rischio trombosi e infezione: minimo se il FICC viene tolto entro 48-72h

TABLE II. Option of Vascular Access for TA

Access Type	Use
Peripheral Vein	Short-term, less frequent and shorter treatments, large veins
Nontunneled CVC	Short-term treatments, filter-based and centrifugation-based systems
Tunneled CVC	Long-term (weeks to months) treatments, filter-based and centrifugation-based systems
Totally implantable ports	Long-term (weeks to months) treatments, filter-based and centrifugation-based systems
AVF	Long-term (years) treatments

Kalantari 2012

Vascular access type	Indications for use
Peripheral Veins	Centrifugal based TA Acute or intermittent TA
Non-tunneled central venous catheters	Short term use only (<2 weeks) Acute or intermittent TA Centrifugal or filter based TA
Tunneled central venous catheters	Short or long term use Centrifugal or filter based TA
Arteriovenous Fistula (AVF)	Chronic TA (>3 months) Centrifugal or filter based TA

Golestaneh 2013

Access type	Setting
Peripheral veins	Adequate veins; one or few procedure(s) anticipated
Non-tunneled CVCs	Veins not adequate; one or few procedure(s) anticipated
Tunneled CVCs	Veins not adequate; several procedures anticipated; potential long-term (weeks/months) use (e.g., for chemotherapy)
Port-CVCs	Veins not adequate; several procedures/weeks-months of access anticipated

Padmanabhan 2018

THE JOURNAL OF PEDIATRICS • www.jpeds.com

Short-Term Femoral Catheter Insertion: A Promising Alternative to Consistently Allow Long-Term Erythrocytapheresis Therapy in Children with Sickle Cell Anemia

Marie Billard, MD[1], Sylvie Combet, MD[2], Olivier Hequet, MD, PhD[3], Kamila Kébaïli, MD[4], Sylvie Lorthois, MD[5], and Corinne Pondarre, MD, PhD[4,6]

Erythrocytapheresis procedures, increasingly used in the management of patients with severe complications of sickle cell disease, are limited by adequate venous access. We have successfully used short-term femoral catheter insertion, during a 6.5-year period for a total of 443 procedures, to perform long-term erythrocytapheresis in 18 consecutive children with sickle cell disease. *(J Pediatr 2013;162:423-6)*

Aferesi cronica periodica

- Un catetere venoso centrale stabile che duri nel tempo e che assicuri la performance richiesta è fondamentale per il successo dell'aferesi cronica
- E' fondamentale la scelta del dispositivo
  - Ottimale per uso discontinuo
  - Ottimale per uso a medio-lungo termine
- E' fondamentale la tecnica di impianto!
  - Corretto posizionamento della punta

Opzione CVC bilume tunnellizzato

- Ideale nei pazienti con aferesi cronica periodica
- Svantaggio: catetere esterno da medicare
- Dispositivi di prima scelta: **CVC bilume in PUR (o in SIL 'armato') destinati a procedure dialitiche, inseriti come CICC (punta in atrio destro)**
- Dispositivi di seconda scelta: uso 'off label' di CVC bilume destinati ad altri scopi (CICC in silicone per oncologia; PICC bilume power injectable; etc.)

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Port-CVCs	Veins not adequate; several procedures/weeks-months of access anticipated

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PICC per la aferesi?

- Per la reinfusione:
  - Ovviamente, qualunque PICC sarà ok
- Per il prelievo, i fattori critici sono:
  - La lunghezza (quindi: inserzione off label come CICC)
  - Il calibro (usare PICC 5Fr bilume oppure PICC 6Fr bilume cuffiati)
  - Il materiale: usare necessariamente PICC in PUR power injectable
  - La posizione : punta in atrio destro
  - Il percorso: evitare tragitti curvilinei
  - Il flusso: maggior successo per flussi bassi (pediatria)

PICC Power Injectable

La power injectability permette:

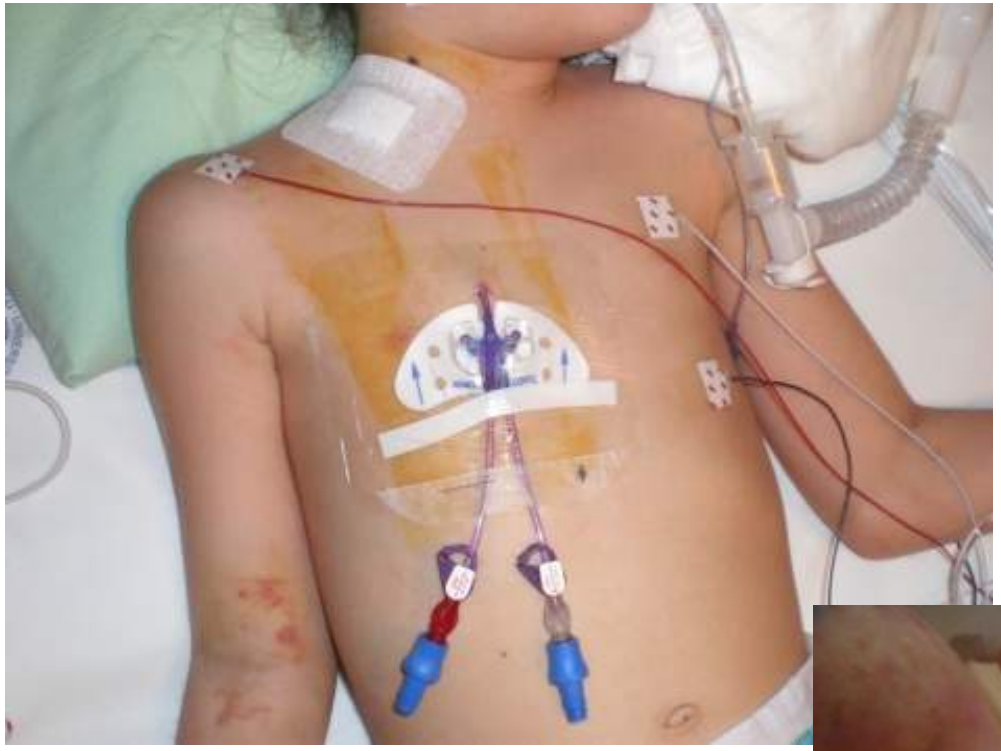
- Flussi più alti (da 2 a 5 ml/sec)
  - Anche per i cateteri multilume
  - Adeguato per procedure di feresi/diafiltrazione
- Minor rischio di ostruzione
- Più facile disostruzione (idraulica)

Si può usare un PICC per il prelievo?

- **Uso ‘off label’: probabilmente sì**
  - Usando PICC power injectable in poliuretano non valvolati
  - Inserendoli ‘off label’ come CICC o FICC
  - Evitando lunghezze eccessive
  - Evitando tragitti curvilinei
  - Utilizzando calibri adeguati
- **Uso ‘in label’ (dal braccio): probabilmente no**
  - I PICC power arrivano a 3-5 ml/sec, ma il limite invalicabile è l’apparecchio della aferesi

Nostra esperienza nel bambino

- **PICC bilume 5Fr in poliuretano power injectable, usati ‘off label’ come CICC**
- Utilizzati per aferesi cronica
- Inseriti in vena anonima destra, per via ecoguidata
- Tunnellizzati ma non cuffiati
- Minima lunghezza (uso come CICC!)
- Minima curvatura (tunnellizzazione ‘retta’ verso la fossa sopraclaveare)
- Flussi ottenuti: 25-30 ml/min



CVC bilume

- Due diversi design strutturali:
  - **CVC specifici per emodialisi**
    - I due lumi fuoriescono a distanza di 2cm circa: lume distale + lume prossimale
  - **Uso 'off label' di CVC destinati ad altri scopi**
    - I due lumi possono terminare simultaneamente
    - RISCHIO DI RICIRCOLO?
      - Non dimostrato per i cateteri per dialisi (flussi 300 ml/min)
      - Teoricamente possibile durante la feresi

Port per la aferesi?

- Soltanto nei pazienti con aferesi cronica periodica
- Vantaggio: sistema tutto sottocute
- Fattibile soltanto mediante port bicamera/bilume con caratteristiche speciali
  - Puntura con aghi Huber speciali (16G)
  - Camera ‘vortex’
  - Catetere power injectable
  - Calibro ampio per entrambi i lumi
  - Minima curvatura del catetere nel tratto tunnellizzato
  - Punta posizionata in atrio
- Maggiore efficacia con bassi flussi (in pediatria)

BRIEF REPORT

Use of Vascular Ports for Long-Term Apheresis in Children

Rajat Chand, MD, Madeleine Sertic, MD, Rose Nemec, RN, Keturah Tomlin, RN, and Bairbre Connolly, MB, FRCP(C), FRCSI, MCh

ABSTRACT

High-flow ports have been used for apheresis in adults. The purpose of this study was to demonstrate the efficacy of ports for apheresis in children and to survey satisfaction of patients and their families with their use. A retrospective review of clinical details was combined with a prospective assessment of the experience of patients and their families. Eight patients (mean age, 10.4 y; mean weight, 35 kg) had nine ports placed for long-term apheresis. All 246 treatment sessions were completed successfully. Access difficulties occurred in eight of 246 sessions (3%). Alarms occurred in 40 of 246 sessions (16%), resulting in delays in 10 of 246 sessions (4%). A survey of early experience indicated overall satisfaction with and a preference for ports for apheresis.

Journal of Clinical Apheresis 30:353–358 (2015)

Use of a Dual Lumen Port for Automated Red Cell Exchange in Adults With Sickle Cell Disease

Anuj Shrestha,[1] Zeeshan Jawa,[1] Kathryn L. Koch,[1] Amy B. Rankin,[1] Qun Xiang,[2] Anand Padmanabhan,[3,4] Matthew S. Karafin,[3,4] and Joshua J. Field[1,4]*

[1]*Department of Medicine, BloodCenter of Wisconsin, Milwaukee, Wisconsin*
[2]*Department of Biostatistics, BloodCenter of Wisconsin, Milwaukee, Wisconsin*
[3]*Department of Pathology, Medical College of Wisconsin, Milwaukee, Wisconsin*
[4]*Medical Sciences Institute, BloodCenter of Wisconsin, Milwaukee, Wisconsin*

Red cell exchange (RCE) is a common procedure in adults with sickle cell disease (SCD). Implantable dual lumen Vortex (DLV) ports can be used for RCE in patients with poor peripheral venous access. We performed a retrospective cohort study of RCE procedures performed in adults with SCD. The main objective of the study was to compare the inlet speed, duration of procedures and rate of complications performed through DLV ports to those performed through temporary central venous and peripheral catheters. Twenty-nine adults with SCD underwent a total of 318 RCE procedures. Twenty adults had DLV ports placed and 218 procedures were performed using DLV ports. Mean length of follow-up after DLV port placement was 397 ± 263 days. Six DLV ports were removed due to infection and 1 for malfunction after a mean of 171 ± 120 days. Compared to temporary central venous and peripheral catheters, DLV port procedures had a greater rate of procedural complications, a longer duration, and a lower inlet speed (all $P < 0.01$). When accounting for the maximum allowable inlet speed to avoid citrate toxicity, 40% of DLV port procedures were greater than 10% below maximum speed, compared to 7 and 14% of procedures performed through temporary central venous and peripheral catheters ($P < 0.0001$). In conclusion, DLV ports can be used for RCE in adults with SCD, albeit with more procedural complications and longer duration. The smaller internal diameter and longer catheter of DLV ports compared to temporary central venous catheters likely accounts for the differences noted. J. Clin. Apheresis 30:353–358, 2015.

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Consensus SIDEM-GITMO 2011

- *"…Central venous ports are not suitable for apheresis…"*

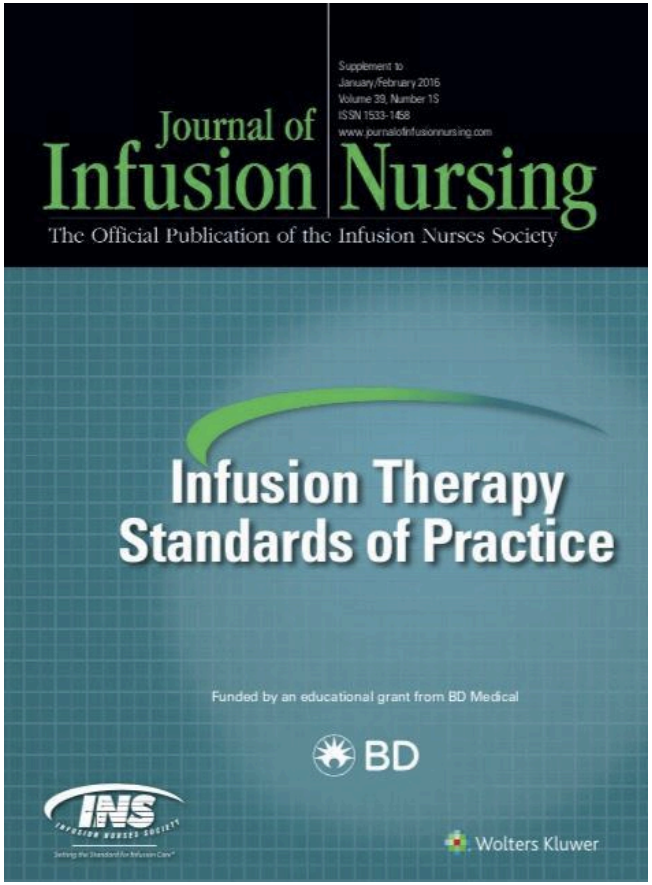
Nostra esperienza

- Tentativo di utilizzo di port bilume ‘vortex’ di grosso calibro
- Posizionamento in vena anonima destra
- Accesso con aghi di Huber 16G
- Rottura del catetere dopo tre sedute di feresi
  - N.B.: il catetere NON era power injectable

Analoga esperienza, negli stessi mesi, presso lo IEO (R.Biffi)

Fistola artero-venosa

- Esclusivamente per aferesi cronica periodica a tempo indeterminato
- Utilizzo estremamente raro
- Fistola A-V (o addirittura Graft A-V) confezionata come per la emodialisi cronica periodica
- Accesso mediante aghi 14G-16G



2016

Arteriovenous (AV) fistulae and AV grafts may be placed for long-term treatment.[1-3] (IV)

Protocolli di scelta dell'accesso

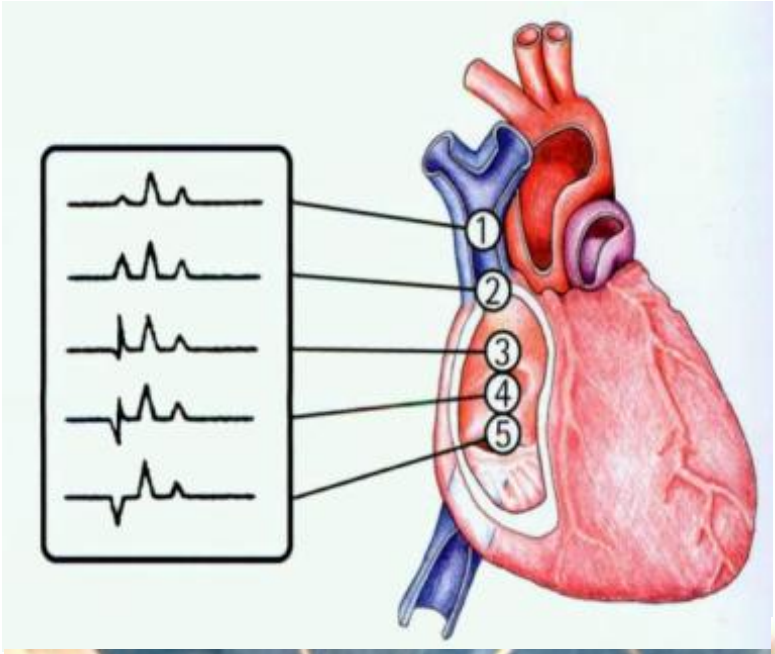
- Valutare mediante esame clinico ed ecografico tutte le disponibilità venose del paziente
- **Aferesi acuta**
  - Prima opzione: prelievo tramite CVP
    - Valutare la opportunità di utilizzare come reinfusione CVP/CVC già in sede
  - Seconda opzione: FICC bilume non tunnellizzato
- **Aferesi cronica**
  - CICC bilume tunnellizzato come prima scelta

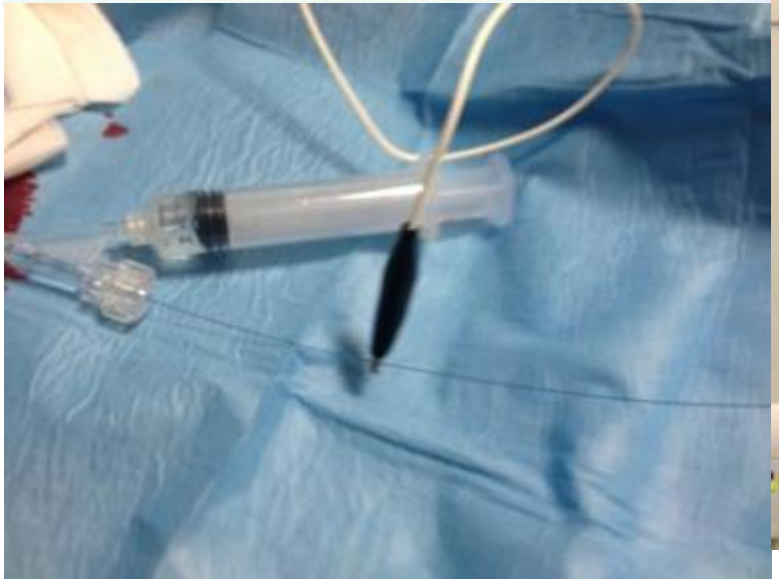
Impianto CVP

RACCOMANDAZIONI 'FORTI'

- Soltanto nelle vene degli arti superiori
- Agocannule di calibro appropriato
- Studiare sempre gli arti del paziente (bilat.) anche utilizzando l'ecografo
- Usare l'ecoguida in caso di DIVA
  - Vena basilica nel solco bicipito-omerale
  - Vene brachiali sotto il margine del bicipite
  - Vena cefalica subito sopra la linea antecubitale

Impianto CVC: tip location!





Conclusioni

Conclusioni

TRE SFIDE – OGGI - PER LE SOCIETA' CHE SI OCCUPANO DIRETTAMENTE O INDIRETTAMENTE DI AFERESI

1. Definire algoritmi di scelta dell'accesso vascolare per aferesi
2. Implementare la adozione dei protocolli di impianto raccomandati dalle linee guida
3. Implementare la adozione dei protocolli di gestione raccomandati dalle linee guida

PICC: utilizzi atipici

- Utilizzati come CICC per ridurne la lunghezza
  - Vena Ascellare
  - Vena Anonima

PICC Power Injectable

La power injectability permette:

- Flussi più alti (da 2 a 10 ml/sec)
  - Anche per i cateteri multilume
  - Anche per procedure di feresi/diafiltrazione
- Minor rischio di ostruzione
- Più facile disostruzione (idraulica)

Corretto posizionamento della punta

- In atrio dx per evitare che la punta vada a parete
- ECG intracavitario
- Problemi
  - lumi sfalsati per evitare ricircolo
  - Superabile posizionando 2 cateteri
    - sovrapponibile al vecchio ‘Tesio’
    - aumento CRT?
    - riduzione vasi venosi utilizzabili

GRAZIE