III Convegno Nazionale GAVePed

Gli Accessi Venosi nel Neonato e nel Bambino

Convegno online, in diretta streaming su www.gaveceltconnection.it

Stravaso (prevenzione e diagnosi precoce)

Vito D'Andrea

GdS Accessi Vascolari Neonatali

Sesta sessione – ore 11:30 – 13:00 Complicanze non infettive

TABLE 1 Guidelines for Vascular Access in Preterm Infants <33 Weeks' Gestation

Gestation	UVC	UAC	PIV
≤26 wk	Recommended	Recommended	
27–28 wk	Recommended	Recommended for selected cases[a]	
≥29 wk	Avoid except in selected cases[a,b]	Recommended for selected cases[a]	Recommended

Nurses were to inform the staff neonatologist if PIV could not be established after 4 attempts.

[a] Use only if the patient is intubated and ventilated, or $F_{IO_2} > 40\%$ on continuous positive airway pressure, or the patient is hemodynamically unstable, needing fluid bolus or inotropes.

[b] Difficulty establishing PIV access.

Indicazioni TIN UCSC

EG (sett)	Vena Omb.	Arteria Omb.	Vena Perif.
<26	SI	SI, se A o B	NO
27 - 28	SI	SI, se B	NO
29 - 31 + A o B o C o D o E o G	SI	NO	NO
29 - 31	NO	NO	SI
32 –33 + A o B o C o D o E	SI	NO	NO
32 –33 + F	NO	NO	SI
32 –33	NO	NO	NO
≥ 34 + A o B o C o D o E	SI	NO	NO
≥ 34 + F	NO	NO	SI
≥34	NO	NO	NO

A. *Ventilazione assistita con tubo OT*
B. *Instabilità emodinamica*
C. *CPAP con Fio2 >30%*
D. *Difficoltà reperire accesso periferico*
E. *SGA + centralizzazione del circolo/AED/ARED*
F. *PN < 1500 g*
G. *PN ≤ 1000 g*

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ORIGINAL ARTICLE

Peripheral intravenous cannulation: complication rates in the neonatal population: a multicenter observational study

Monique Legemaat[1,2], Peter J. Carr[3,4], Roland M. van Rens[5], Monique van Dijk[6], Irina E. Poslawsky[2,7], Agnes van den Hoogen[2,8]

Introduction: Neonates admitted to a neonatal intensive care unit (NICU) rely highly on intravenous (IV) therapy, for which the peripheral intravenous cannula (PIVC) is the preferred device to allow such therapies to proceed. Placement of a PIVC is a painful procedure and repeated attempts for successful insertion should therefore be limited. We aimed to quantify the incidence, complications, and factors associated with these complications.

Methods: We conducted a prospective observational study to examine PIVC-related complications in level III NICUs of two university medical centers (UMC) in The Netherlands. We performed descriptive analyses and binary logistic regression analysis to identify factors associated with PIVC complications.

Results: A total of 518 catheters were inserted in 235 infants. The first-time success rate was 45%. The predominant reason for non-elective removal due to complications was infiltration (N = 193; 67%). No significant association was found between discipline of the inserter, vein visualization device and location of the PIVC and whether or not a catheter needed to be removed due to a complication.

Conclusions: In this study the majority of PIVCs were removed after the occurrence of a complication. The most common complication was infiltration. Strategies to identify and prevent infiltration in an NICU population are required. Future interventional studies should attempt to improve first-time insertion success and reduce PIVC failure from infiltration in the neonate. Based on the results of the present study, neonatologists and physician assistants are the preferential PIVC inserters. Advanced training of all members of vascular access specialist teams and ongoing monitoring of PIVC-related complications are recommended.

	n (%)
Successful completion/end of therapy	69 (13.3)
Complication	288 (55.6)
Infiltration	193 (67.0)
Leaking catheter	53 (18.4)
Catheter occlusion	15 (5.2)
Other	27 (9.3)
Reason unknown	150 (29.0)
Died or transferred	14 (2.7)

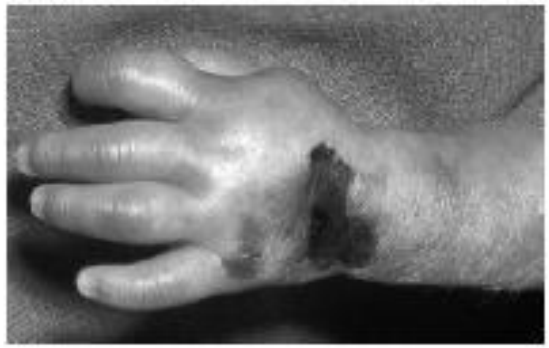
SHORT REPORT

Extravasation injuries on regional neonatal units

C E Wilkins, A J B Emmerson

Arch Dis Child Fetal Neonatal Ed 2004;**89**:F274–F275. doi: 10.1136/adc.2003.028241

This survey of regional neonatal intensive care units determined a prevalence of 38 per 1000 neonates who sustained an extravasation injury that caused skin necrosis. Most injuries occurred in infants of 26 weeks gestation or less, with parenteral nutrition infused through intravenous cannulae. Common treatments were exposing wounds to the air, infiltration with hyaluronidase and saline, and occlusive dressings.



ORIGINAL ARTICLE

DOI: http://dx.doi.org/10.1590/S1980-220X2017040103360

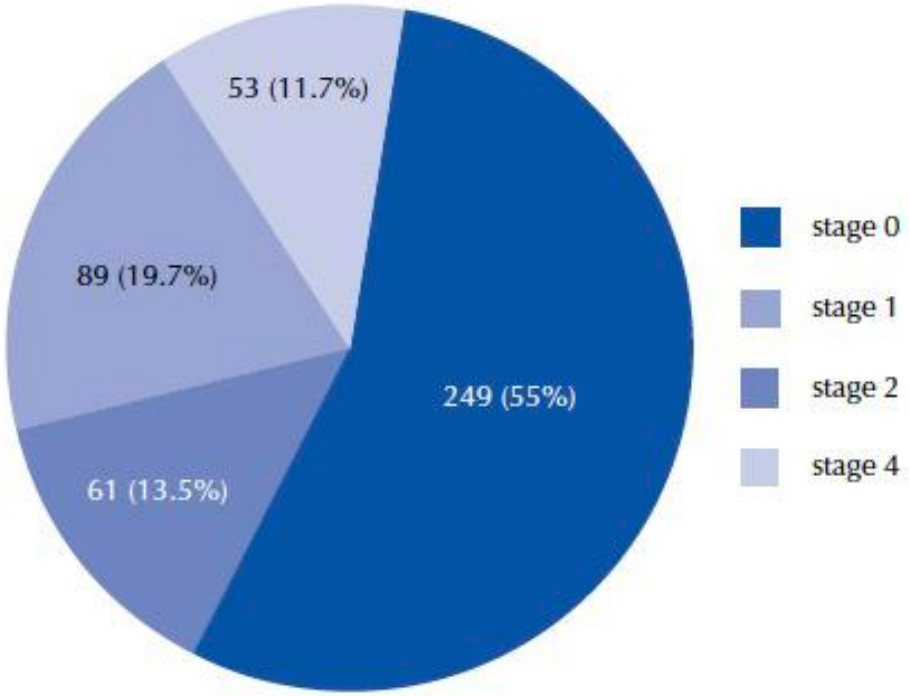
Incidence of infiltration/extravasation in newborns using peripheral venous catheter and affecting factors

45%

Selma Atay[1], Selcen Sen[2], Dilek Cukurlu[2]

Several Variables	Infiltration/ Extravasation				X^2	p
	Observed infiltration / extravasation		Not observed infiltration / extravasation			
	n	%	*n*	%		
Gestational Week						**.007**
<28 wks (extremely preterm)	10	66.7	5	33.3	12.147 (sd=2)	
28 wks to 31 wks +6 days (very preterm)	18	72.0	7	28.0		
32 wks to 36 wks+ 6 days (late preterm)	75	44.6	93	55.4		
>37 wks (full term)	99	40.6	145	59.4		
Birth weight						**.015**
1,000-1,499	26	65.0	14	35.0	8.370 (sd=2)	
1,500-2,499	79	45.7	94	54.3		
3,000-+	97	40.6	142	59.4		
Antibiotic therapy						**0.001**
No use	14	22.6	48	77.4	14.991	
Single antibiotic	60	45.1	73	54.9		
Multiple antibiotic	128	49.8	129	50.2		
Delivery of TPN						
TPN delivered	145	60.2	96	39.8	50.022 (sd=1)	**.000**
TPN not-delivered	57	27.0	154	73.0		

Note: TPN= Total Parenteral Nutrition.


53 (11.7%)
89 (19.7%)
249 (55%)
61 (13.5%)
stage 0
stage 1
stage 2
stage 4

RESEARCH ARTICLE Open Access

Neonatal extravasation injury: prevention and management in Australia and New Zealand-a survey of current practice

Matthew Restieaux[1], Andrew Maw[1], Roland Broadbent[2], Pam Jackson[2], David Barker[2] and Ben Wheeler[2*]

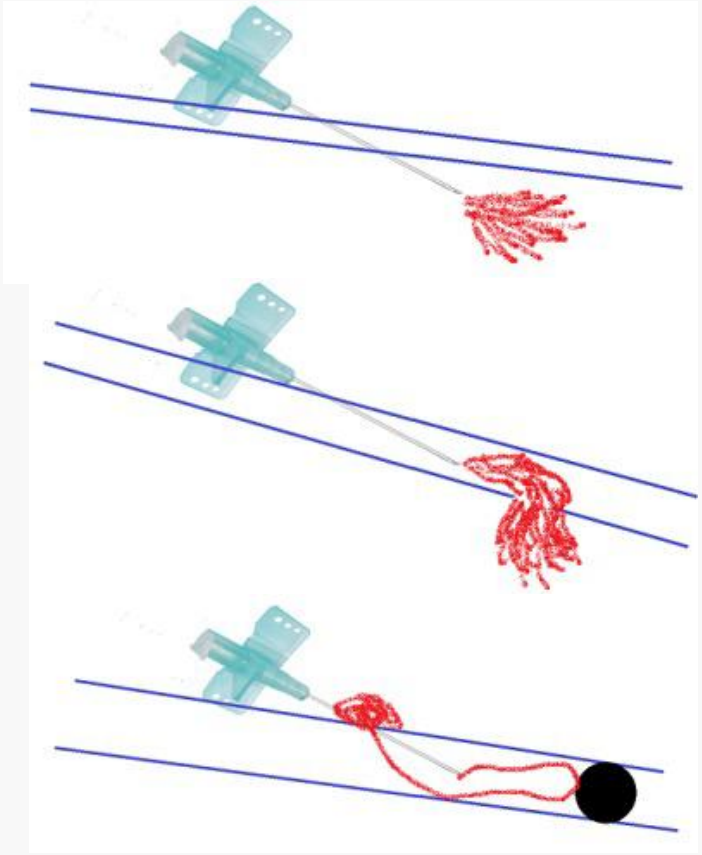
Recognition & prevention of EI:	
Units with written policy/standard practice	24/26 (92%)
Of these, policy includes:	
Regular nursing observations:	21/24 (88%)
Keeping skin over tip of line visible	18/24 (75%)
Line flush before drug administration	14/24 (58%)
Treatment of EI:	
Units with written policy/standard practice	24/26 (92%)
Of these, treatment policy includes:	
Immediate line removal	21/24 (88%)
Limb elevation	15/24 (63%)
Saline washout via small incisions	16/24 (67%)
Hyaluronidase	9/24 (38%)
Warm or cold compress	1/24 (4%)
Complications of EI:	
Number of units reporting significant extravasation complication	24/26 (92%)
Central injuries reported:	
Cardiac Tamponade (with associated deaths in 2 units)	13/26 (50%)
Hepatic injury	10/26 (38%)
Peritoneal	8/26 (31%)
Retroperitoneal	3/26 (12%)
Pleural	7/26 (27%)
Peripheral injuries reported:	
Limb endangering	6/26 (23%)

Meccanismo dello stravaso/infiltrazione:

La punta del catetere perfora la parete del vaso con conseguente infusione della soluzione nel tessuto circostante

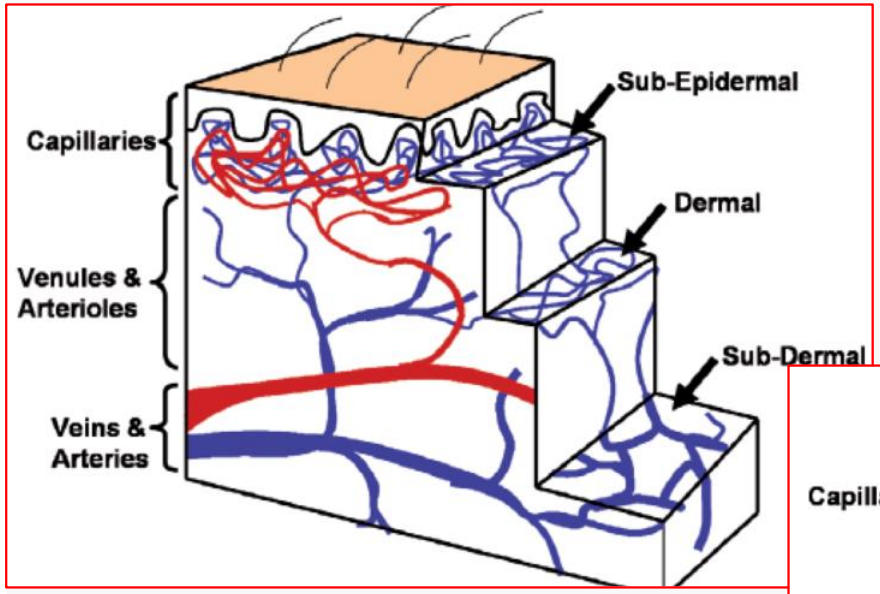
Caratteristiche chimiche intrinseche del farmaco come Osmolarità e pH irritano la parete del vaso portando ad una lesione dello stesso e quindi allo stravaso.

La punta del catetere rimane nel vaso, la vasocostrizione dovuta all'infusato o all'irritazione della parete del vaso, crea una pressione negativa e conseguente dispersione dell'infusato attraverso il foro di inserzione del catetere.

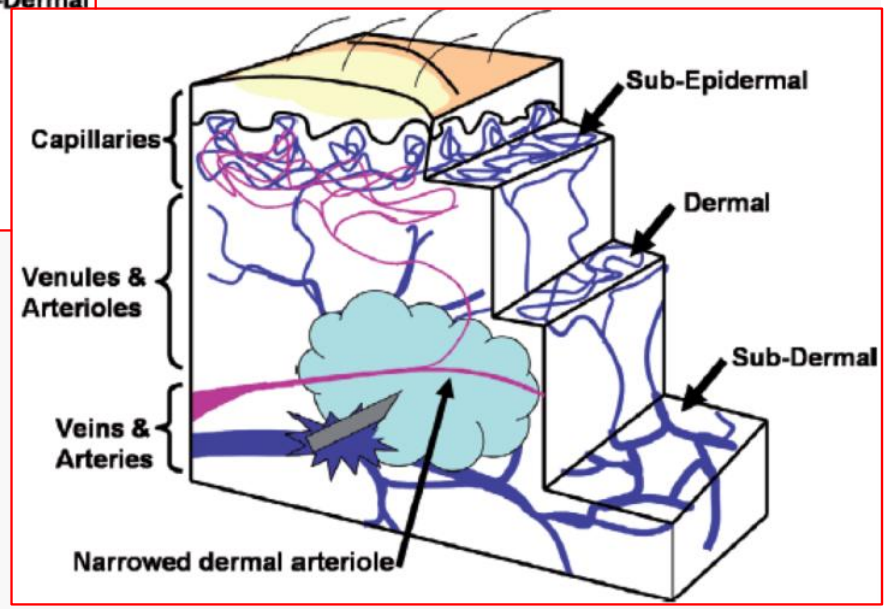


(Koeppel, 2006)(Beall et al., 2013)

FISIOPATOLOGIA DEL DANNO TISSUTALE



La componente arteriosa viene compressa dell'edema provocando ischemia.
Si crea inoltre danno tissutale dato dalle caratteristiche chimiche del farmaco.



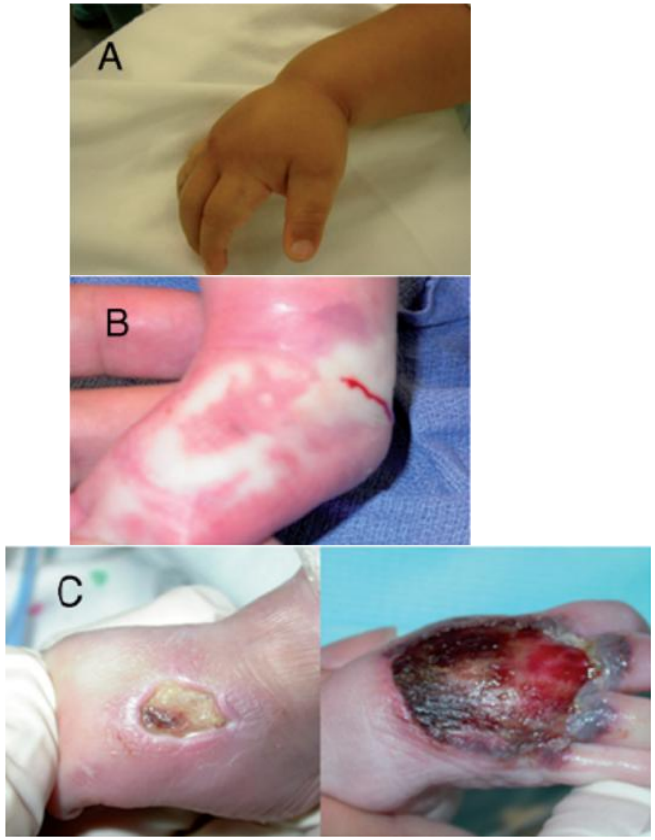
(INS, 2011)

SCALA VALUTAZIONE INFILTRAZIONE/STRAVASO

STADIO II

STADIO III

STADIO IV



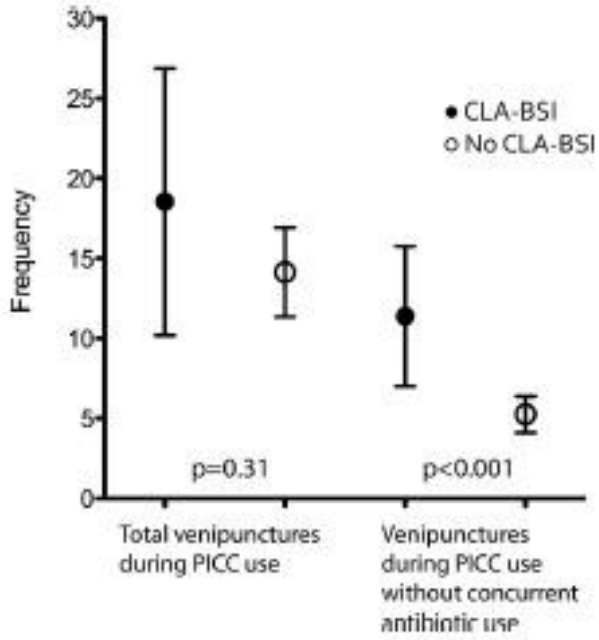
Stadio I	1. Dolore al sito di inserzione 2. No eritema 3. No gonfiore
Stadio II	1. Dolore al sito di inserzione 2. Leggero gonfiore(0-20 %) rispetto all'arto controlaterale 3. No sbiancamento 4. Buon polso arterioso nel sito dello stravaso/infiltrazione 5. Refill Capillare < 2 secondi
Stadio III	1. Dolore al sito di inserzione 2. Marcato gonfiore(30-50 %) rispetto all'arto controlaterale 3. Sbiancamento 4. Cute fredda al tocco 5. Buon polso arterioso nel sito dello stravaso/infiltrazione 6. Refill Capillare <2 secondi
Stadio IV	1. Dolore al sito di inserzione 2. Marcato gonfiore(>50 %) rispetto all'arto controlaterale 3. Sbiancamento 4. Cute fredda al tocco 5. Diminuito o polso arterioso assente nel sito dello stravaso/infiltrazione 6. Refill Capillare > 4s 7. Cute lesionata o necrosi

- Perdita accesso
- Sospensione infusionale
- Dolore
- Punture multiple

Increased frequency of peripheral venipunctures raises the risk of central-line associated bloodstream infection in neonates with peripherally inserted central venous catheters

Hao-Yuan Cheng [a], Chun-Yi Lu [a], Li-Min Huang [a], Ping-Ing Lee [a], Jong-Min Chen [b], Luan-Yin Chang [a,*]

	Total
Patient number	125
Gestational week[a]	28.7 ± 0.3
Birth bodyweight (g)[a]	1102.9 ± 49.0
Chronological age at PICC insertion (d)[a]	7.5 ± 0.9
ICU duration at PICC insertion (d)	7.6 ± 0.9
Cormobidities (*n*)	
Lung diseases[a]	79 (63)
GI diseases[b]	16 (13)
CHD[c]	66 (53)
CNS diseases[d]	24 (19)
Hydrops fetalis	4 (3)
Renal failure	8 (6)



↑ 16% ogni venipuntura

European Journal of Pediatrics
https://doi.org/10.1007/s00431-018-3234-7

ORIGINAL ARTICLE

Elective replacement of intravenous cannula in neonates—a randomised trial

Li Yen Chin[1] · Timothy A. Walsh[1] · Karen Van Haltren[1] · Laura Hayden[1] · Miranda Davies-Tuck[2] · Atul Malhotra[1,2,3]

	Standard ($n=55$)	Elective ($n=58$)
Infant characteristics		
Gestation (weeks) (median, IQR)	35 (33–39)	36 (33–39)
Male (n, %)	34 (62)	30 (52)
Birth weight (g) (mean, SD)	2571 (947)	2708 (919)

	Standard	Elective	Crude ratio (95% confidence interval)	p value
Intention to treat analysis, participant numbers	55	58		
Any extravasation, per patient (n, %)	33 (60)	28 (48.3)	RR 0.80 (0.57 to 1.13) RD − 0.12 (− 0.30 to 0.07)	0.21
Extravasation event, per 1000 IV hours	7.8	6.1	HR 0.91 (0.55 to 1.5)	0.70
Per protocol analysis, participant numbers	55	45		
Any extravasation, per patient (n, %)	32 (58.2)	24 (53.3)	RR 0.92 (0.65 to 1.30) RD − 0.05 (− 0.24 to 0.15)	0.63
Extravasation event, per 1000 IV hours	7.3	6.5	HR 1.14 (0.66 to 1.96)	0.63

Peripheral intravenous cannula (PIVC) insertion is one of the most common invasive procedures performed in neonates and is frequently associated with adverse events. There are no studies in the neonatal population looking at the possibility of reducing the risk of PIVC-related complications by elective replacement of PIVC. A randomised, non-blinded, control trial was conducted in a tertiary level neonatal unit in Melbourne, Australia, to examine rates of extravasation in neonates with elective replacement of PIVC as compared to standard practice. Neonates born at 32 weeks of gestation or more were randomly assigned to have their PIVC replaced electively (every 72–96 h) or when clinically indicated in a 1:1 allocation ratio after parental consent. Primary outcome studied was rate of extravasation. Secondary outcomes included rates of phlebitis, leakage or spontaneous dislodgement of PIVC. One hundred thirteen infants were enrolled. Extravasation was noted in 33 (60%) of standard practice group vs. 28 (48.3%) of elective replacement (RR 0.80, CI 0.57–1.13, $p=0.21$) infants. Time to first extravasation was similar between the groups (hazard ratio 0.69, CI 0.42–1.15). Extravasation events per 1000 IV hours were also similar between groups. Similar results were seen by both intention to treat and per protocol analyses. There was an increase in leaking rates (HR1.98, CI 1.03–3.81, $p=0.04$) in the elective group, while phlebitis and spontaneous dislodgement rates were similar to standard group.

Conclusion: Elective replacement of PIVC in neonates is not associated with reduction in extravasation rates.

DOI: 10.1097/JPN.0000000000000385

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Efficacy of Vein Visualization Devices for Peripheral Intravenous Catheter Placement in Preterm Infants

A Randomized Clinical Trial

Seda Çağlar, PhD, RN; Funda Büyükyılmaz, PhD, RN; İlkay Bakoğlu, RN; Sevil İnal, PhD, RN; Özgül Salihoğlu, MD

Figure 2. AccuVein AV400.

Figure 3. Wee-Sight Transilluminator.

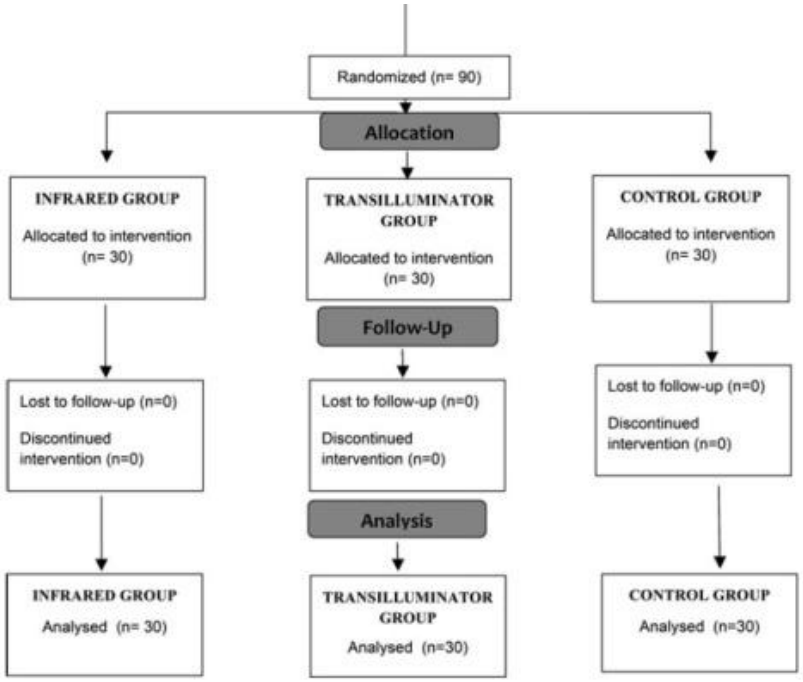

Table 2. **Comparison of the physical parameters and cannulation success of preterm infants (*N* = 90)**

Variables	Transilluminator group (*n* = 30)	Infrared group (*n* = 30)	Control group (*n* = 30)	Statistical test; *P* value
Body temperature, °C				
Preintervention	36.37 ± 0.17	36.46 ± 0.11	36.14 ± 1.78	$F = 0.773$; $P = .465$
Postintervention	36.39 ± 0.17	36.46 ± 0.11	36.44 ± 0.14	$F = 1.605$; $P = .207$
Pulse rate				
Preintervention	142.20 ± 12.75	136.70 ± 14.34	138.93 ± 17.90	$F = 0.999$; $P = .372$
Postintervention	148.00 ± 13.33	139.43 ± 13.57	143.63 ± 16.41	$F = 2.615$; $P = .079$
Respiratory rate				
Preintervention	53.73 ± 8.45	50.13 ± 5.08	50.37 ± 5.80	$F = 2.789$; $P = .067$
Postintervention	58.03 ± 10.56	51.93 ± 5.12	55.27 ± 8.50	$F = 3.991$; $P = .022$
Time to successful cannulation mean ± SD, s	45.27 ± 30.83	8.70 ± 2.56	17.30 ± 8.40	$F = 32.01$; $P = .000$
Success of the first attempt, *n* (%)				
Yes	18 (60)	24 (80)	26 (86.7)	$\chi^2 = 6.26$; $P = .04$
No	12 (40)	6 (20)	4 (13.3)	

Table 3. **Comparison of dwell time and pain scores of preterm infants (*N* = 90)**

Variables	Transilluminator group (*n* = 30)	Infrared group (*n* = 30)	Control group (*n* = 30)	Statistical test; *P* value
Dwell time of PIVC, mean ± SD, d [Min-Max]	1.27 ± 0.45 (1-2)	1.57 ± 0.50 (1-2)	1.27 ± 0.45 (1-2)	$F = 4.10$; $P = .02$
NIPS scores, mean ± SD				
Preintervention	0.17 ± 0.38	0.23 ± 0.43	0.20 ± 0.41	$F = 0.202$; $P = .817$
During seeking appropriate vein	0.60 ± 0.85	0.33 ± 0.18	0.33 ± 0.18	$F = 12.076$; $P = .000$
During cannulating the vein	1.66 ± 0.84	1.33 ± 0.96	1.26 ± 0.64	$F = 2.025$; $P = .138$

Journal of Perinatology (2016), 1–4

www.nature.com/jp

ORIGINAL ARTICLE

Continuous infusion versus intermittent flushing: maintaining peripheral intravenous access in newborn infants

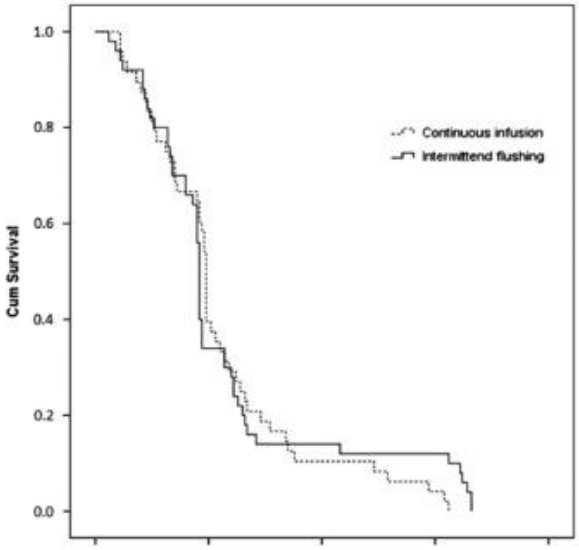

Table 1. Demographic characteristics of cohort 1 (continuous infusion) and cohort 2 (intermittent flushing)

	Cohort 1 (n=48)			*Cohort 2 (n=50)*	
	%	*n*		%	*n*
Gender					
Male	58.3	28		56	28
Female	41.7	20		44	22
Gestational age					
Mean (±s.d.)			40+3 (±9 days)		
42–40 weeks	70.8	34		50	25
40–37 weeks	29.2	14		50	25

Complication	*Cohort 1: continuous infusion (n=48)*	*Cohort 2: intermittent flushing (n=50)*
	n (%)	*n (%)*
No complication	27 (56)	39 (78)
Infiltration	13 (27)	4 (8)
Phlebitis	4 (8)	0 (0)
Occlusion	3 (6)	3 (6)
Loss of function due to manipulation	1 (2)	4 (8)

Original research article

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1–5

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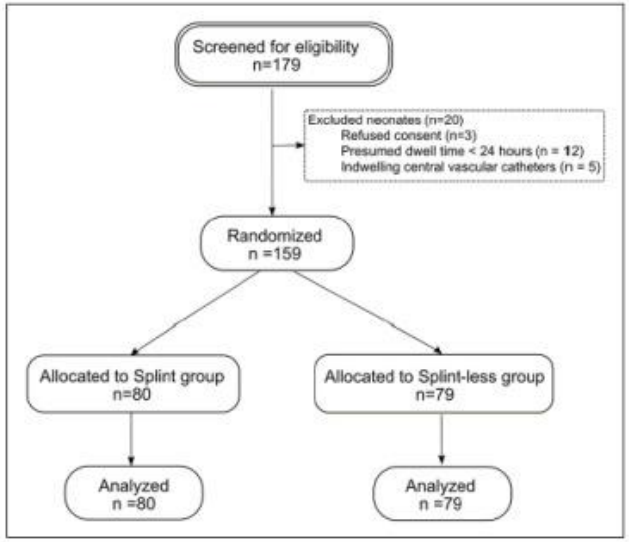
SAGE

Peripheral intravenous cannulae in neonates: To splint or not?

Tiroumourougane Serane V[1], Rathnapratheep Rajasekaran[2], Vijayasankar Vijayadevagaran[1] and Bhuvaneswari Kothendaraman[3]



Parameter	Range	Splint (%)	No splint (%)
Study population		80 (50.3)	79 (49.7)
Sex	Boys	51 (32.1)	30 (18.9)
Gestational age (weeks)	≤34	30 (18.9)	49 (30.8)
	35–36	18 (11.3)	12 (7.5)
	≥37	32 (20.1)	18 (11.3)
Weight (grams)	<1500	10 (6.3)	28 (17.6)
	1500–2500	38 (23.9)	25 (15.7)
	>2500	32 (20.1)	26 (16.3)
Place of delivery	Outborn	45 (28.3)	34 (21.4)
Site of insertion	Hand	55 (34.6)	50 (31.4)
	Forearm	4 (2.5)	10 (6.3)
	Foot	14 (8.8)	10 (6.3)
	Leg	7 (4.4)	9 (5.7)
Inserting person	Doctor	17 (10.7)	39 (24.5)
	Senior staff nurse	57 (35.8)	31 (19.5)
	Staff nurse	6 (3.8)	9 (5.7)
Crossing a joint	Yes	27 (17.0)	31 (19.5)
	No	53 (33.3)	48 (30.2)
Purpose of vascular access	Intermittent	3 (1.9)	2 (1.3)
	Continuous	77 (48.4)	70 (44.0)
	Parenteral nutrition	0 (0)	7 (4.4)

Reasons for removal	Splint group (%)	Splintless group (%)	p Value
Extravasation	70 (44)	66 (42)	0.704
Erythema	11 (7)	7 (4)	
Palpable cord	3 (2)	2 (1)	

Results: Out of 159 neonates, 80 were allotted to splint group and the rest to splint-less group. Mean dwell time of intravenous line in splint group was 27.68 ± 13.03 h which was significantly less than in splint-less group (32.87 ± 15.79 h, mean difference: 5.11 h, *p* value: 0.03). Subgroup analysis in preterms showed mean dwell time of 28.54 ± 14.86 h in splint group which was less than that of splint-less group (35.10 ± 16.24 h) (*p* value: 0.03). No such difference was noted in the term neonates. Subgroup analysis for catheters put across joints does not show difference in mean dwell times between splint and splint-less groups. Multivariate regression analysis did not identify any variable which independently affected the outcome.

Conclusion: Use of splint does not prolong the dwell time of the catheter and is probably harmful in some neonates.

Essere neonato è un fattore di rischio indipendente

RESEARCH ARTICLE Open Access

Clinical practice guideline on the prevention and management of neonatal extravasation injury: a before-and-after study design

Kam Ming Chan[1,2], Janita Pak Chun Chau[2*], Kai Chow Choi[2], Genevieve Po Gee Fung[1], Wai Wa Lui[3], Meme Suk Ying Chan[1] and Suzanne Hoi Shan Lo[2]

Table 1 Demographic and clinical characteristics of the neonate participants

Variables	Control Group ($n = 104$) *F*(%)	Intervention Group ($n = 1$ *F* (%)
Gender		
Male	59 (56.7)	56 (51.4)
Female	45 (43.3)	53 (48.6)
Gestational age (week)	Mean (SD): 36.80 (4.31)	Mean (SD): 36.47 (4.65)
Birth weight (kg)	Mean (SD): 2.59 (0.95)	Mean (SD): 2.53 (0.92)

Table 2 Details of the intravenous therapy for the neonate participants

Variables	Control Group ($n = 104$) *F* (%)	Intervention Group ($n = 109$) *F* (%)
Peripheral IV device for continuous infusion.	53 (50.96)	52 (47.71)
Peripheral IV device with vesicant administration.	11 (10.58)	17 (15.60)
Number of peripheral IV catheter in-situ.	Mean (SD) 2.88 (2.85)	Mean (SD) 2.86 (2.96)
Peripheral IV catheter days.	Mean (SD) 8.22 (8.76)	Mean (SD) 9.48 (8.79)
Number of patients with CVC.	26 (25%)	31 (28.44%)
Number of CVC in-situ.	Mean (SD) 1.58 (0.50)	Mean (SD) 1.45 (0.51)
CVC days.	Mean (SD) 15.58 (8.41)	Mean (SD) 14.23 (6.97)

Interventions

1. Assess signs and symptoms of PIVE.
2. Assess peripheral IV infusion site/s hourly.
3. Identify high-risk drugs/infusates for PIVE.
4. For high-risk drugs/infusates, assess peripheral IV site/s every 10 minutes.

Administer high-risk drugs/infusates via a CVC.

5. Administer parenteral nutrition via a CVC.
6. Assess patency of peripheral IV device/s prior to drug administration.
7. Secure peripheral IV device with transparent dressing.
8. Splint extremities with a peripheral IV device in situ.
9. Assess patient for ECL.
10. Confirm correct position of CVC tip.
11. Initiate actions for managing PIVE at once.
12. Grade PIVE severity with infiltration scale.
13. Implement management of Grade 1 and 2 PIVE.
14. Notify physician for Grade 3 and 4 PIVE.
15. Administer Hyaluronidase for PIVE caused by non-vasopressor drugs/infusates.
16. Administer Phentolamine for PIVE caused by vasopressor drugs/infusates.
17. Initiate non-pharmacological pain relief for extravasation injuries.
18. Offer pharmacological pain relief for extravasation injuries.
19. Observe PIVE with intact skin hourly for 12 hours.
20. Remove the CVC for ECL.
21. Initiate nursing interventions to manage ECL.
22. Consult wound nurse for wound management.
23. Document PIVE or ECL on extravasation record.
24. Report extravasation injury to parents.
25. Update progress of extravasation injury to parents.
26. Incident reporting.

Results: 104 and 109 neonates were recruited in the pre-intervention period (control) and the post-intervention period (intervention), respectively. The extravasation rate before and after the intervention was 14.04 and 2.90 per 1,000 peripheral intravenous catheters days, respectively. The adjusted odds ratio of peripheral intravenous extravasation post-intervention compared with that of pre-intervention was 0.20 (95% confidence interval: 0.05–0.74; $p = 0.02$) after adjusting for peripheral intravenous catheter days. The extravasation from a central line rate of the control and intervention groups post-intervention was 4.94 and zero per 1,000 central venous catheter days, respectively. Fifty-nine registered nurses were recruited. At six months post-program, there were significant improvements in the nurses' level of knowledge and adherence.

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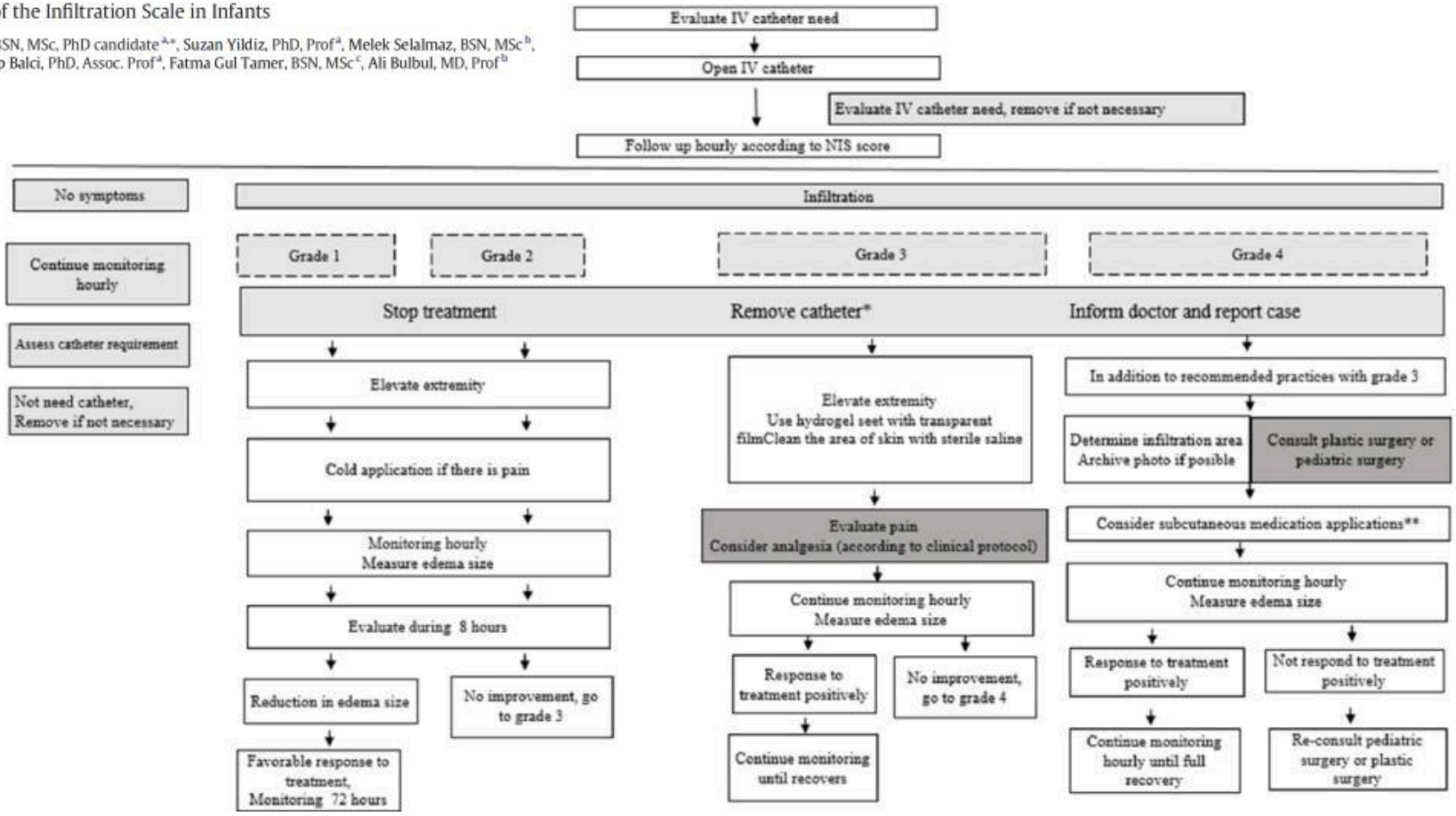
Turkish Validation of the Infiltration Scale in Infants

Mujde Calikusu Incekar, BSN, MSc, PhD candidate[a,*], Suzan Yildiz, PhD, Prof[a], Melek Selalmaz, BSN, MSc[b], Vesile Kantas, BSN[b], Serap Balci, PhD, Assoc. Prof[a], Fatma Gul Tamer, BSN, MSc[c], Ali Bulbul, MD, Prof[b]



47. INFILTRATION AND EXTRAVASATION

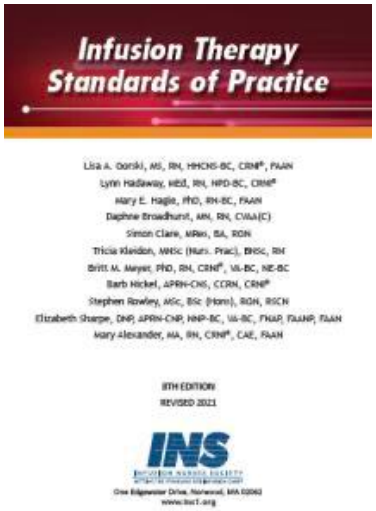
Standard

47.1 The risk of infiltration and extravasation is reduced through careful selection of the most appropriate VAD and insertion site and through establishment of VAD patency prior to and during infusion therapy.

47.2 Peripheral and CVAD sites are regularly assessed for signs and/or symptoms of infiltration and extravasation before and during each intermittent infusion and on regular intervals during continuous infusions.

47.3 Appropriate intervention(s) are implemented immediately upon recognition of infiltration/extravasation as determined by the characteristics of the solution or medication escaping from the vein.

1. Evitare di aree di flessione RaSuVA
2. Stabilizza l'accesso venoso
3. pH e Osmolarità raccomande
4. Somministra concentrazioni di Glucosio non oltre il 10% tramite AVP
5. Usa il diluente raccomandato per la diluizione del farmaco
6. Non fare affidamento alle pompe infusionali
7. Valutare l'accesso venoso almeno 1 volta all' ora
8. Valutare Segni e Sintomi di infiltrazione/stravaso
9. Scala oggettiva di valutazione
10. Flush/Lavaggio del catetere prima di utilizzarlo



Immediately stop the infusion upon identification of infiltration/extravasation injury and initiate appropriate intervention(s).[1,11,16,17,31,36,38] (IV)

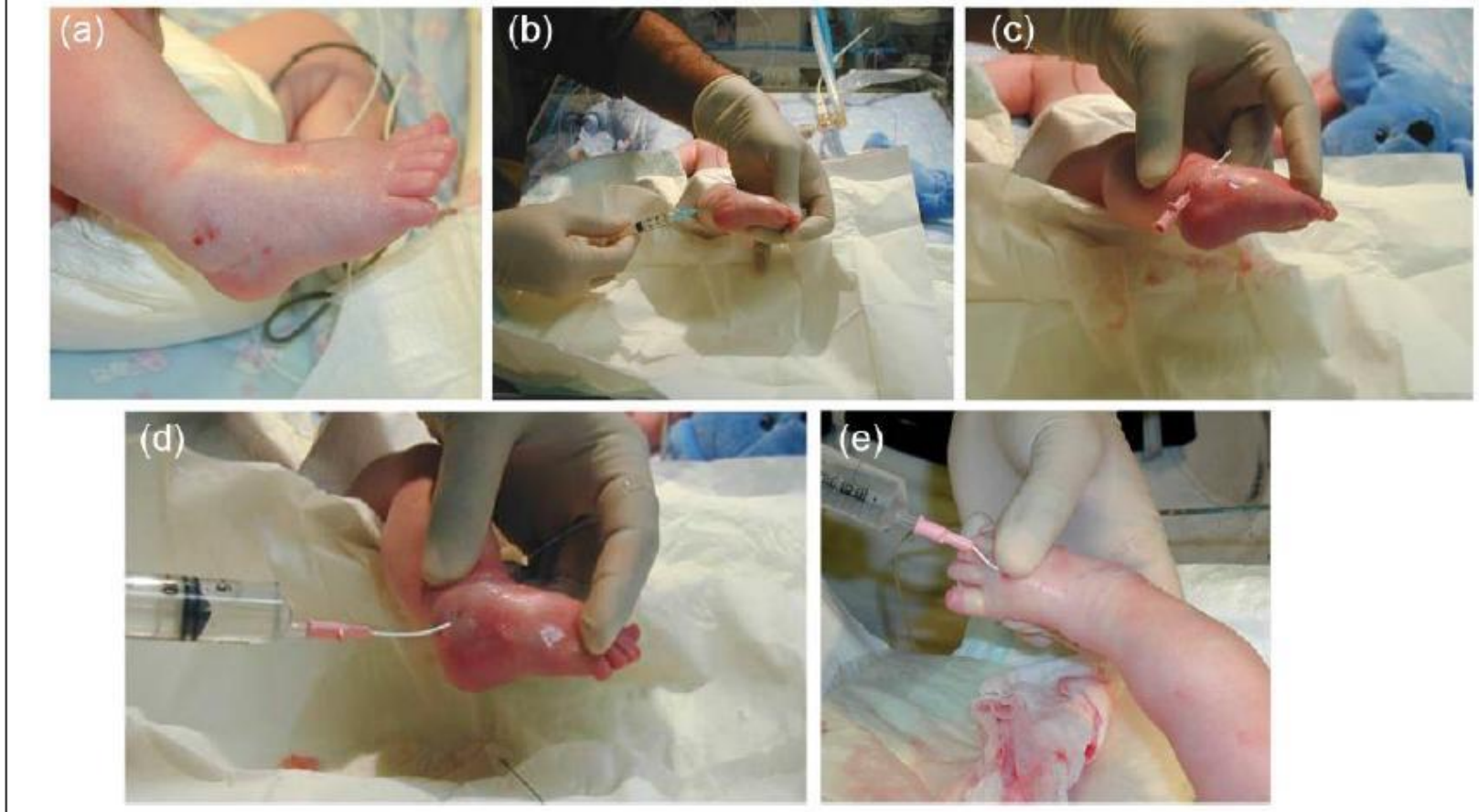
1. Aspirate for a blood return from the peripheral catheter as the tip could be inside the vein lumen, yet an additional puncture of the vein wall may have occurred.[11,17,55] (IV)
2. Do not flush the VAD, as this will inject additional medication into the tissue.[14,20] (V)
3. Disconnect the administration set from the catheter hub and aspirate from the catheter or implanted port access needle with a small syringe, even though a very small amount of fluid may be retrieved.[14,20,38] (V)
   a. Aspiration is not recommended with extravasation of contrast media.[35] (V)
4. Remove the peripheral catheter or implanted vascular access port access needle.[14,20] (V)
5. Avoid application of pressure to the area.[14,20] (V)
6. Elevate the extremity to encourage lymphatic reabsorption of the solution/medication.[1,11,16,20,21,23,31,38] (II)
7. Do not use the affected extremity for subsequent VAD insertion until resolved.[62] (V)
8. Assess the insertion site and surrounding tissue.
   a. Assess the area distal (located below) to the VAD site for capillary refill, sensation, and motor function.[14,20,38] (V)
   b. Using a skin marker, outline the area suspected of infiltration/extravasation to assess progression.[14,20] (V)
   c. Photograph the area to identify progression or exacerbation of the tissue injury in accordance

Follow the established treatment protocol or provider prescription as appropriate for the solution and medication in the tissue, with the goal of limiting the damage from medication/solution exposure. Provide convenient access to the list of vesicants and irritants, infiltration/extravasation management protocols, electronic order forms, supplies, and other materials needed to manage the event.[1,2,14,20,24,64] (IV)

Topical nitroglycerin 2% may be applied as
1-inch strip to the site of vasopressor extrava
sation in absence of phentolamine; repea

Hyaluronidase is not considered to be an antidote to a specific vesicant. It is an enzyme that increases absorption and dispersion of the medication or solution in the tissue and its use is reported with cytotoxic and noncytotoxic drugs, including both acidic and alkalotic

Consider subcutaneous saline irrigation or saline irrigation with prior hyaluronidase administration for vesicant removal/dispersion in neonates.[56] (IV)


(a)
(b)
(c)
(d)
(e)

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Saline irrigation for the management of skin extravasation injury in neonates (Review)

Gopalakrishnan PN, Goel N, Banerjee S

Study	Type of study	Number of neonates	Extravasation	Intervention	Outcome
Casanova 2001	Case series	14 neonates	Dopamine - 9 Caffeine - 2 Calcium - 2 Beta blocker - 1	Hyaluronidase infiltration and aspiration - 12 Saline irrigation and aspiration - 1 Hyaluronidase infiltration alone - 1	3 cases developed skin necrosis but healed spontaneously
Chen Y Y 1996	Case report	1 neonate	Total parenteral nutrition (TPN)	Infiltration with hyaluronidase with saline irrigation	Healing in 3 days
Chowdhury 2004	Retrospective review of 31 cases	31 neonates had 36 extravasations	TPN - 13 Medications - 10 Blood products - 6 Crystalloids - 5 Contrast - 2	Hyaluronidase infiltration and saline irrigation used for 24 extravasation injuries	No surgical graft required
Davies 1994	Case report	2 preterm neonate less than 29 weeks gestation	TPN	Hyaluronidase infiltration and saline irrigation	Minimal or no scarring, no functional sequelae
Gault 1993	Retrospective review of 96 cases	Total 96 cases referred to a tertiary plastic surgical unit (age range - preterm neonate to 72 years - exact distribution not mentioned) 44 early referrals, i.e. within 24 hours 52 late referral, i.e. after 24 hours	TPN Inotrope Ca KCl Bicarbonate Dextrose: 10%-20% Chemotherapeutics Contrast Antibiotics *(exact numbers not mentioned)*	Early referral group: 44 (saline irrigation alone - 37, liposuction and saline irrigation - 6, liposuction alone - 1) Late referral group: wound and surgical management	Early referral group: 39 (88.5%) no soft tissue damage, 5 (11.5%) minor skin blistering Late referral group: 8 (15%) healed without tissue necrosis, 17 (33%) minor skin sloughing, 27 (52%) extensive damage to tissues - 3 amputations
Harris 2001	Retrospective review	56 neonates	TPN Inotrope Calcium	Saline irrigation alone	No skin loss. None required reconstruc-
Kostogloudis 2015	Case report	34 neonates	TPN - 28 10% dextrose - 4 Second-generation cephalosporin - 2	Saline irrigation followed by topical application of paraffin-impregnated gauze and povidone-iodine-soaked gauze dressing	In 21 infants, no signs of soft tissue damage by 24 hours of treatment Minor findings still present for a few days in 7 patents after treatment Ischaemic signs present in 6 patients subsided within 25 days
Kuensting 2010	Case report	1 neonate	Antibiotics	Infiltration with recombinant human hyaluronidase (rHuPH20)	Wound healed completely by 8 days
Martin 1994	Case report	1 neonate	Dobutamine, adrenaline, 8.4% sodium bicarbonate, 10% calcium gluconate	Infiltration of hyaluronidase followed by liposuction and saline irrigation	No signs of soft tissue damage at 2 weeks
Siu 2007	Case report	1 neonate	TPN	Hyaluronidase infiltration and saline irrigation	Healed fully by 5 days

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To date, no RCTs have examined the effects of saline irrigation with or without prior hyaluronidase infiltration for management of extravasation injury in neonates. Saline irrigation is frequently reported in the literature as an intervention for management of extravasation injury in neonates. Research should focus first on evaluating the efficacy and safety of this intervention through RCTs. It will also be important for investigators to determine effect size by examining the timing of the intervention, the nature of the infusate, and severity of injury at the time of intervention.


Monitoring


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go raibh maith agat
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terima kasih
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