Venous catheter related tissue injury in children receiving vasoactive drug infusions during paediatric critical care transport

Niha Peshimam, Kara-Bruce Hickman, Katrina Crawford, Gaurang Upadhyay, Andrew Jones
Children's Acute Transport Service, Great Ormond Street Hospital

Introduction and aims

- Vasoactive drug infusions (VDI) are conventionally administered via a central venous catheter (CVC) to reduce the risk of tissue injury.
- Sepsis guidelines recommend vasoactive drugs are commenced early, and via a peripheral venous catheter (PVC) if central venous access is not available.[1]
- The aim of this study was to report the incidence of tissue injury occurring during and 24 hours after transport as a result of infusing vasoactive drugs via a PVC.

Methods

- The Children's Acute Transport Service (CATS) database was searched retrospectively for patients referred between April 2017 and May 2020 where vasoactive drugs were administered during transport.
- The medical records were reviewed for adverse events related to vascular access, and adverse events were cross referenced with the hospital critical incident database.
- Vasoactive drugs included were adrenaline, noradrenaline, dopamine, dobutamine, and vasopressin.

	VDI via PVC	VDI via CVC	VDI via IO	p-value (PVC vs CVC)
n	199	311	48	.
Median age in months (IQR)	3 (1 - 48)	9 (0.1 - 72)	7 (1 - 36)	.70
Median weight in kg (IQR)	5.5 (3.2 - 18)	7 (3.2 - 24.4)	8.6 (3.8 - 15.1)	.21
Median maximum dose of adrenaline in mcg/kg/min (IQR)	0.2 (0.1 - 0.4) *(n=119)*	0.3 (0.1 - 0.5) *(n=245)*	0.35 (0.2 - 0.6) (n=41)	**<.001**
Median maximum dose of dopamine in mcg/kg/min (IQR)	10 (10 - 15) *(n=88)*	15 (10 - 20) *(n=90)*	20 (10-20) (n=12)	.08
Median PIM3 score (IQR)	0.035 (0.008 - 0.075)	0.091 (0.044 - 0.224)	0.094 (0.046 - 0.244)	**<.001**
Median stabilisation time in minutes (IQR)	140 (110 - 170)	151 (120 - 191) *(n=207*)*	165 (125 - 194)	**.03***
Median journey time in minutes (IQR)	43 (30 - 61)	40 (27 - 70)	40 (30 - 54)	.49
Septic shock n (%)	39 (19.6)	73 (23.5)	13 (27.1)	.30
Congenital heart disease n (%)	14 (7)	42 (13.5)	5 (10.4)	**.02**
Bronchiolitis n (%)	36 (18)	12 (3.9)	5 (4.2)	**<.001**
LRTI n (%)	39 (19.6)	39 (12.5)	16.7 (8)	**.03**
Cardiac arrest n (%)	9 (4.5)	23 (7.4)	8 (16.7)	.19
Tissue injury events n (%)	7 (3.5)	2 (0.6)	3 (6.3)	**.02**

RESULTS

- A total of **3836 children** were transported, of which of **558 required vasoactive drug infusions**.
- **Seven incidents of tissue injury** were noted out of the **199 cases (3.5%)** where vasoactive drug infusions were administered via a PVC. Four extravasation incidents required no intervention, two required a review by a plastic surgeon but with no lasting injury, and in one incident – a child with severe circulatory failure – there was anticipated loss of limb function.
- **359 vasoactive infusions** were administered by CVC, with **six reports of tissue injury (1.7%)**, four of which involved intraosseous (IO) needles.
- On 21 transports noradrenaline was administered via a PVC, with no incidents of tissue injury reported.

Discussion and Conclusions

The incidence of extravasation injuries following administration of vasoactive drugs via PVC's in children is low.
PVC's can be used with caution to safely administer vasoactive drugs during stabilisation and transfer of critically unwell children until definitive central venous access is established.

References
1. Weiss SL, Peters MJ, Alhazzani W, Agus MSD, Flori HR, Inwald DP, et al. Surviving sepsis campaign international guidelines for the management of septic shock and sepsis-associated organ dysfunction in children. Pediatr Crit Care Med. 2020;21(2):e52–106.