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Octyl-butyl cyanoacrylate glue versus splint for stabilising short peripheral intravenous catheters in neonates: a retrospective cohort study

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ABSTRACT

Aim This study was conducted to compare the effectiveness of octyl-butyl cyanoacrylate glue or limb splinting used alone or in combination for stabilising neonatal short intravenous peripheral catheters (SPCs).

Materials and methods This retrospective cohort study analysed routinely collected data from a tertiary neonatal intensive care unit. A total of 45 754 successfully inserted SPCs were grouped into one of three stabilisation strategies: splint+glue, splint only and glue alone. The primary outcome was SPC dislodgement. Secondary outcomes included dwell time, phlebitis, infiltration and extravasation. Multivariable logistic regression analysis was performed to adjust for potential confounders.

Results Of the included SPCs, 1404 were stabilised using splint+glue, 12 006 using splint only and 32 344 using glue alone. In the unadjusted analysis, dislodgement differed between the groups (splint+glue, 1.5%; splint, 2.2%; glue, 2.6%; p=0.002). The median dwell time was the longest in the glue group (33.8 hours), although differences were not clinically significant. The incidence of phlebitis was the highest in the splint group (13.4%) compared with those in the glue (3.8%) and splint+glue (4.2%) groups (p<0.001). Kaplan–Meier survival analysis revealed statistically significant differences between the groups (p<0.001), with the splint+glue group exhibiting the highest catheter survival and the splint group the lowest. In multivariable analysis, the combined use of splint and glue was independently associated with reduced odds of dislodgement. Glue-based securement strategies were also associated with significantly lower odds of phlebitis compared with splint-only stabilisation.

Conclusion Cyanoacrylate glue represents a safe and effective strategy for stabilising SPCs in neonates. Glue-based securement is associated with a substantially lower incidence of phlebitis and, when combined with splinting, may further reduce the risk of dislodgement. These findings support the integration of adhesive-based securement into neonatal vascular access practice.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Recent studies support the use of glue for peripheral vascular device securement. When device security and stability are most pertinent, glue is a safe and effective adjunct to reduce intravenous therapy failures in the vulnerable neonatal population.

WHAT DOES THIS STUDY ADD

⇒ This is the largest cohort study (n=45 754 short intravenous peripheral catheters (SPCs)) directly comparing three SPC stabilisation strategies—splint only, glue only and glue+splint—in neonates, offering robust data under standardised protocols.

⇒ The study demonstrates that splint use has the highest complication rates, whereas glue securement achieves the longest dwell times and the lowest incidence of phlebitis, supporting reconsideration of routine splint use in neonatal vascular access care.

HOW MIGHT THIS STUDY AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These results inform clinical practice and guideline development by providing robust observational evidence to support adhesive-based catheter stabilisation in neonatal intensive care units, potentially improving outcomes and minimising procedural harm.

INTRODUCTION

The insertion and stabilisation of short intravenous peripheral catheters (SPCs)[1] in neonates presents unique challenges owing to limited venous access sites, small vessel size and fragile skin integrity.[2] Catheter dislodgement remains a common complication, often necessitating repeated insertions, which increases the risk of infection, delays treatment and may lead to long-term neurodevelopmental consequences due to repeated episodes of procedural pain and stress.[2–5] Evidence-based guidelines and research have emphasised that stabilisation strategies should prioritise insertion site visibility, secure fixation and preservation of skin integrity, particularly in vulnerable neonatal populations.[2 6–9]

Traditionally, splints (also referred to as limb boards) were frequently employed in

neonatal intensive care units (NICUs) to immobilise joints near the catheter site, minimise catheter movement and provide an anchoring site for tapes, avoiding direct application to the skin.[10–12] However, the everyday use of splints for SPC stabilisation and securement remains debated.[7 10–13] Detractors suggest that splints may obscure the catheter insertion site, thereby hindering timely detection of adverse events.[11–13] Randomised controlled trials have reported that splinting does not significantly prolong catheter dwell time and may contribute to increased risk of complications such as pressure injury, skin breakdown and delayed recognition of infiltration or phlebitis.[10 14–17] Although some studies have methodological weaknesses,[18] concerns about the effectiveness and safety of using splints to stabilise SPCs have prompted a re-evaluation of this traditional strategy and stimulated increased interest in alternative securement techniques.

An important innovation in vascular catheter securement has been the development of medical-grade cyanoacrylate adhesives.[7 19–21] However, it is important to distinguish between formulations designed for topical wound closure—such as Dermabond (Ethicon/Johnson & Johnson Medtech, Cincinnati, OH, USA), Surgiseal (H.B. Fuller Medical Adhesive Technologies, Hudson, NC, USA) and Liquibond (Advanced Medical Solutions, Winsford, Cheshire, UK)—and those specifically formulated for vascular catheter securement. Each formulation differs in polymerisation, flexibility and cytotoxicity, which can directly affect patient safety and clinical performance. Currently, only one cyanoacrylate adhesive—SecurePortIV (H.B. Fuller Medical Adhesive Technologies)—has both Food and Drug Administration (FDA) approval and *Conformité Européenne* (CE) marking for catheter securement. Unlike conventional wound closure glues, catheter-specific adhesives are optimised for secure fixation at the catheter–skin interface, offering rapid polymerisation, reduced brittleness and minimal cytotoxicity, making them more suitable for neonatal application.[19 20]

In essence, cyanoacrylate-based medical glues are formulated for use in different clinical contexts and should not be considered interchangeable. The primary purpose of wound closure cyanoacrylate is to approximate and bond skin edges to support wound healing. In contrast, cyanoacrylate glues formulated for catheter securement, as used in this study, are intended to stabilise the catheter–skin interface and limit micromovement at the insertion site and not to close wounds or seal skin edges. This distinction is essential for patient safety and clinical utility.

Cyanoacrylate adhesives form strong bonds between the catheter and the skin on exposure to moisture, minimising micromotion without restricting natural postural movement.[19–23] These glues used in vascular access are reported to be haemostatic, create a barrier to antimicrobial ingress and are bacteriostatic,[19 20] though these properties were not directly evaluated in the current study. Formulations specifically designed for use in vascular access have become established as essential adjuncts for optimal practice for central vascular access devices.[6 7 19–25] Recent clinical studies and quality improvement initiatives have demonstrated that cyanoacrylate glue can improve SPC dwell time, reduce phlebitis and enhance site visualisation, thereby improving overall outcomes in neonatal vascular access management.[7 26]

Regardless of the evidence supporting cyanoacrylate use in central vascular access and emerging data for SPCs, unequivocal evidence about the optimal strategy for SPC stabilisation is lacking. This study aims to compare the clinical performance of three SPC stabilisation strategies in neonates: (1) cyanoacrylate glue alone, (2) splint combined with glue and (3) splint alone to inform clinical practice and policy.

MATERIALS AND METHODS

Design

This retrospective cohort study utilised routinely collected anonymised clinical data.

Participants

The study population consisted of all neonates who required a successfully inserted SPC during their NICU stay and included all sexes, gestational ages and birth weights. The study site was a large 128-cot tertiary-level NICU located in a Middle Eastern country. Neonates were excluded from the study population if they had any pre-existing skin condition at the insertion site, experienced failed SPC insertion or used another vascular access device (eg, central vascular device and neonatal peripherally inserted central catheter/epicutaneo-caval catheter). Neonates with incomplete data on catheter insertion or removal were also excluded.

Data on the study participants were stratified into three groups based on the stabilisation method applied:

1. Splint+glue: SPCs secured with both cyanoacrylate glue and an Argyle I.V. Baby Support Board limb splint.
2. Splint only: SPCs stabilised using an Argyle I.V. Baby Support Board.
3. Glue alone: SPCs secured exclusively with octyl-butyl cyanoacrylate glue (SecurePortIV, H.B. Fuller Medical Adhesive Technologies).

All three methods used a transparent membrane dressing (3M Tegaderm) applied over the insertion site to protect it. Cyanoacrylate glue, when used, was applied immediately after confirmed successful catheter insertion and reapplied during any dressing changes. As this was a retrospective study, the choice of stabilisation method was not subject to predefined selection criteria but reflected standard clinical practice at the time of insertion.

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Procedural oversight

All SPC-related insertion and maintenance procedures, together with monitoring and data collection, were undertaken by nursing members of the Neonatal Vascular Access Team (NeoVAT). This team consists of a multidisciplinary group of specialised nurses and physicians with responsibility for all peripheral and central vascular access in the NICU.

SPC insertion and maintenance followed local protocol based on international guidelines (eg,[6 8]). Briefly, this protocol includes adherence to the '5 Rights for Venous Access' framework, which ensures a robust preassessment to ensure the right device for the right vein, therapy, time frame and patient.[22]

Vein selection was supported by near-infrared (NIR) visualisation technology, and SPC choice was guided by patient weight, therapy duration, fluid osmolarity/pH and previous venous access history.

Dressing changes were performed only when clinically indicated (eg, dressing loosening or contamination) by NeoVAT members in collaboration with bedside nurses. When necessary, acetone-free adhesive remover pads (Medline) were used during transparent dressing removal before aid removal of dressing adhesives.

Outcomes and data collection

The primary outcome was to evaluate SPC dislodgement, defined as unplanned removal due to inadequate stabilisation or patient movement. Secondary outcomes included catheter dwell time (from insertion to removal, in hours) and the incidence of complications, such as infiltration, extravasation and phlebitis. Phlebitis was defined according to institutional vascular access protocols as the presence of clinical signs at or near the catheter insertion site, such as erythema, swelling, tenderness and/or a palpable venous cord, as documented in the vascular access database. All data were extracted from the institutional vascular access database, which contained routinely logged SPC events and complications.

Statistical analysis

Descriptive statistics summarised patient demographics and baseline characteristics. Categorical variables were compared using χ^2 tests, and continuous variables were analysed using independent t-tests or the Kruskal–Wallis H for non-normally distributed continuous data (eg, number of insertion attempts).

Time-to-event data, including the catheter dwell time, were analysed using the Kaplan–Meier survival analysis, with group comparisons performed using the log-rank (Mantel–Cox) test. ORs and 95% CIs were calculated for dislodgement and complication rates. A two-sided $p<0.05$ was considered statistically significant.

The unit of analysis was the individual SPC; therefore, multiple catheters from the same infant were included as independent observations, reflecting real-world clinical practice. Multivariable logistic regression analyses were performed to adjust for potential confounders.

To identify factors associated with dislodgement/accidental removal, univariate and multivariable logistic regression analyses were performed. Variables significant in univariate analysis were entered into the multivariable model, and backward stepwise selection was used to derive the final model. Variables considered included gestational age at birth, current gestational age, birth weight, current weight, catheter details (including catheter gauge and device type), insertion site and securement strategy.

Variables significant in the univariate analysis were entered into the multivariable model, and backward stepwise selection was used to derive the final model. Variables considered included gestational age at birth, current gestational age, birth weight, current weight, catheter details (including catheter gauge and device type), insertion site and securement strategy.

RESULTS

A total of 45 754 SPCs were placed in neonates during the study period. Of these, 1404 SPCs (3.1%) were stabilised using splint+glue, 12 006 (26.2%) using splint only and 32 344 (70.7%) using glue alone. Figure 1 presents the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) flow diagram showing SPC group allocation and inclusion.

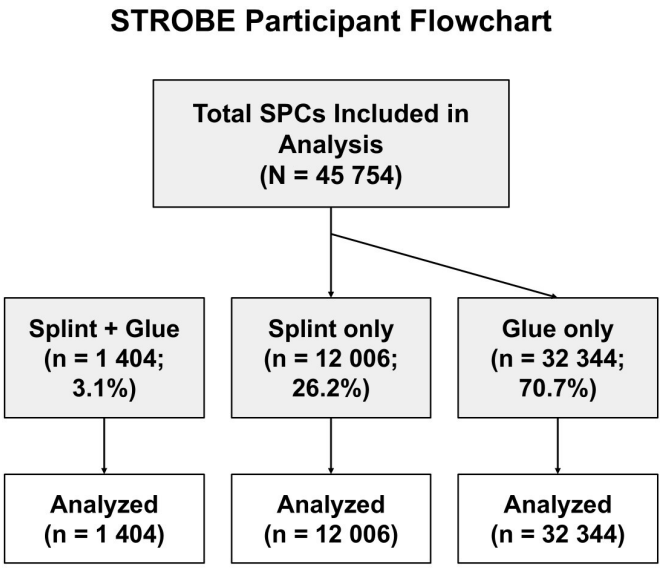

Figure 1 STROBE participant flowchart. STROBE flow diagram illustrating group allocation and analysis of SPCs in neonates. All 45 754 SPCs inserted during the study period were included in the analysis and stratified by securement method: splint+glue (n=1404), splint only (n=12 006) and glue alone (n=32 344). No exclusions occurred because of incomplete data. SPCs, short intravenous peripheral catheters; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

No participants were excluded because of incomplete data. Table 1 summarises the baseline demographic characteristics of the three groups. The mean (±SD) gestational age at insertion was 34.6±4.7 weeks, and the mean birth weight was 2345±976 g across all groups. Males comprised 57% and females 43% of the study population. Compared with the other groups, the glue group included a slightly higher proportion of neonates born before 28 weeks of gestation.

Table 2 summarises the vascular access procedural characteristics of the three groups. The reasons for SPC insertion were most commonly for the administration of intravenous fluids and medications, followed by blood extraction, blood transfusion and investigative procedures. All the SPCs used were of either 24 or 26 gauge, with 26 gauge being the most frequently selected size, representing 99.3% of all SPCs inserted. This reflects local protocols for using the smallest size catheter whenever possible. The brand of SPCs varied over time, reflecting availability and hospital purchasing. However, all devices were manufactured from either polyurethane (PUR) or polychlorotrifluoroethylene (PCTFE). The most common insertion sites were the hand, foot and lower arm, with slight variation across the groups.

Table 3 summarises the outcome measures. For the primary outcome, catheter dislodgement rates were 1.5% in the splint+glue group, 2.2% in the splint group and 2.6% in the glue group. In the unadjusted analysis, the dislodgement rates differed significantly between the groups (p=0.002), with the lowest rate observed in the

Table 1 Baseline demographic characteristics

	Splint+glue		Splint only		Glue alone	
	n=1404	%	n=12006	%	n=32344	%
Sex						
Male	795	56.6	6940	57.8	18393	56.9
Female	608	43.3	5058	42.1	13905	43.0
DSD*	1	0.1	8	0.1	46	0.1
Gestational age at birth (weeks)						
Mean (±SD)	34.9±4.7		34.4±4.6		34.6±4.7	
<28	165	11.8	1459	12.2	4085	12.6
28–31	152	10.8	1801	15.0	3538	10.9
32–36	374	26.6	4123	34.3	11012	34.0
>36	713	50.8	4623	38.5	13709	42.4
Gestational age at time of insertion (weeks)						
Mean (±SD)	35.9±3.8		35.6±4.1		35.8±4.0	
<28	41	2.9	402	3.3	1229	3.8
28–31	175	12.5	1586	13.2	3670	11.4
32–36	413	29.4	4853	40.4	12305	38.0
>36	775	55.2	5165	43.1	15140	46.8
Birth weight (grams)						
Mean (±SD)	2395±985		2275±978		2345±976	
<1000	158	11.2	1505	12.5	4073	12.6
1000–1499	116	8.3	1144	9.5	2662	8.3
1500–2499	458	32.6	4367	36.4	10686	33.0
>2500	672	47.9	4990	41.6	14923	46.1
Weight at the time of insertion (grams)						
Mean (±SD)	2455±920		2355±925		2420±914	
<1000	76	5.4	660	5.5	1985	6.1
1000–1499	135	9.6	1520	12.7	3325	10.3
1500–2499	510	36.3	4702	39.1	11803	36.5
>2500	683	48.7	5124	42.7	15231	47.1

*DSD: disorder of sex differentiation.

Table 2 Vascular access procedural characteristics

	Splint+glue		Splint only		Glue alone		
	n=1404	%	n=12006	%	n=32344	%	P value
Insertion attempts before successful insertion							
Median (range)	1 (5)		1 (5)		1 (5)		<0.001
Mean±SD	1.43±0.79		1.27±0.56		1.33±0.67		
Reason for insertion							
Blood extraction	126	9.0	460	3.8	3742	11.6	<0.001
Blood transfusion	49	3.5	446	3.7	1258	3.9	
Intravenous fluids/medication	1207	85.9	10942	91.2	26846	83.0	
Procedure*	22	1.6	158	1.3	498	1.5	
SPC details							
24 g Neoflon	0	<0.1	264	2.2	39	0.1	<0.001
24 g Vasofix	0	<0.1	0	<0.1	8	<0.1	
24 g Supercath	0	<0.1	0	<0.1	12	<0.1	
26 g Neoflon	1	0.1	7643	63.7	40	0.1	
26 g Vasofix	505	36.0	4014	33.4	2704	8.4	
26 g Supercath	898	64.0	85	0.7	29541	91.3	
Extremity of insertion							
Ankle	1	0.1	14	0.1	4	<0.1	<0.001
Elbow	0	<0.1	23	0.2	8	<0.1	
Foot	158	11.3	1665	13.9	2449	7.6	
Hand	1198	85.3	9708	80.9	28610	88.5	
Knee	0	<0.1	1	<0.1	2	<0.1	
Lower arm	41	2.9	381	3.2	1126	3.5	
Lower leg	0	<0.1	19	0.2	31	0.1	
Scalp	2	0.1	4	<0.1	6	<0.1	
Upper arm	1	0.1	26	0.2	32	0.1	
Upper leg	0	<0.1	4	<0.1	10	<0.1	
Wrist	3	0.2	161	1.3	66	0.2	
Side of insertion							
Left	791	56.4	6457	53.8	17138	53.0	<0.001
Right	611	43.5	5546	46.2	15204	47.0	
Midline	2	0.1	3	<0.1	2	<0.1	

*Procedure refers to SPCs inserted for diagnostic or procedural purposes, including contrast injection for imaging or to ensure intravenous access during inter-facility transfer.
SPCs, short intravenous peripheral catheters.

splint+glue group and the highest in the glue group. Despite this difference, the overall catheter survival patterns were similar across the groups.

To identify independent predictors of dislodgement/accidental removal, univariate and multivariable logistic regression analyses were performed (table 4). In the univariate analysis, gestational age at birth, current gestational age, birth weight, current weight, catheter details, insertion site and securement strategy were significantly associated with dislodgement risk.

In the multivariable model, current gestational age (adjusted OR (aOR) 1.67, 95% CI 1.47 to 1.91, p<0.001), current weight (aOR 1.37, 95% CI 1.22 to 1.55, p<0.001) and catheter details (aOR 1.12, 95% CI 1.04 to 1.21, p=0.007) remained independently associated with increased odds of dislodgement. The combined use of splint and glue was independently associated with reduced odds of dislodgement (aOR 0.55, 95% CI 0.35 to 0.85, p=0.007).

The model demonstrated moderate explanatory value (Nagelkerke R^2=0.36), indicating that the included variables accounted for a meaningful proportion of the variability in dislodgement risk.

Table 3 Outcome measures

	Splint+glue		Splint only		Glue alone		
	n=1404	%	n=12006	%	n=32344	%	P value
Administrative censoring*	20	1.4	146	1.2	466	1.4	ns
Therapy completed (no complications)	598	42.6	4583	38.2	14016	43.3	<0.001
Unplanned removal	786	56.0	7277	60.6	17862	55.3	<0.001
Reason for unplanned removal							
Dislodgement	21	1.5	259	2.2	835	2.6	0.002
Discolouration	8	0.6	65	0.5	181	0.6	ns
Leaking	177	12.6	1360	11.3	4210	13.0	ns
Occlusion	65	4.6	486	4.0	1421	4.4	ns
Phlebitis	59	4.2	1613	13.4	1218	3.8	<0.001
PIVIE†	456	32.5	3494	29.2	9997	30.9	<0.001
Dwell time (hours)							
Mean (±SD)	32.58±24.86		33.57±25.72		33.79±29.87		0.003

*Administrative censoring: participant dies or is transferred to another unit.
†PIVIE: peripheral intravenous infiltration/extravasation.
ns, not significant.

Variables significant in the univariate analysis were entered into the multivariable logistic regression model. Backward stepwise selection was used to derive the multivariable model (model performance: Nagelkerke R^2= 0.36).

Kaplan–Meier survival analysis (figure 2) demonstrated significant differences in catheter survival probability among the three groups (log-rank test, p<0.001). The splint+glue group showed the highest catheter survival over time, whereas the splint group showed the lowest. The median time at which 50% of SPCs remained in situ occurred latest in the splint+glue group but earliest in the splint group.

The median SPC dwell time was 33.6 hours in the splint+glue group, 32.6 hours in the splint group and 33.8 hours in the glue group. Notably, the longest dwell times were observed in the glue group, but these differences were not statistically significant (p>0.05). No untoward medical events related to skin-related harm due to the use of medical adhesives (glue, tape or dressing adhesives) or vascular access medical device-related pressure injury were reported during the study.

Infiltration and extravasation rates were comparable across all groups, and no significant increase in these complications was observed with cyanoacrylate glue use. Phlebitis occurred in 4.2% of the insertions in the splint+glue group, 13.4% in the splint group and 3.8% of the glue group. The difference in phlebitis incidence was statistically significant (p<0.001), with the splint group showing the highest rate of this complication.

DISCUSSION

This observational study assessed the performance and safety of three SPC securement strategies in a large neonatal cohort. The findings that cyanoacrylate glue was safe to use, did not cause adverse skin-related effects and provided secure catheter stabilisation are consistent with results reported in other studies concerning its use in central and peripheral vascular access.[20–26] The

Table 4 Multivariable logistic regression analysis of factors associated with catheter dislodgement

Factor	B	SE	Wald	P value	OR	95% CI
Current gestational age	0.515	0.068	58.243	<0.001	1.67	1.47 to 1.91
Current weight	0.317	0.062	25.803	<0.001	1.37	1.22 to 1.55
Catheter details	0.117	0.038	9.249	0.007	1.12	1.04 to 1.21
Splint and glue used	–0.601	0.223	7.302	0.007	0.55	0.35 to 0.85

Variables significant in the univariate analysis were entered into the multivariable logistic regression model. Backward stepwise selection was used to derive the multivariable model. Model performance: Nagelkerke R^2=0.36.

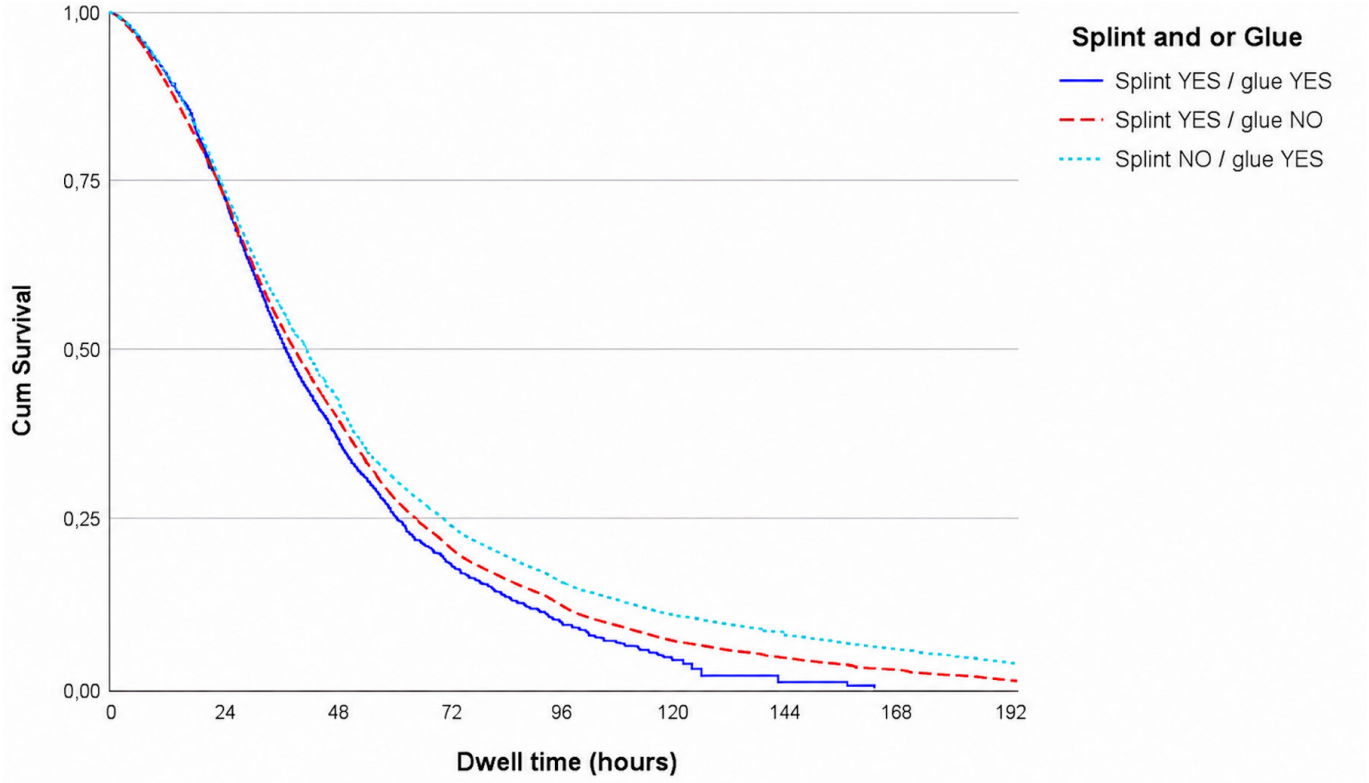

Figure 2 Survival curve (Kaplan–Meier). Kaplan–Meier survival curve showing the time to catheter removal for SPCs stabilised using splint+glue (n=1404), splint only (n=12 006) and glue alone (n=32 344). The splint+glue group demonstrated the highest catheter survival probability, whereas the splint group demonstrated the lowest (log-rank test, p<0.001).

regulatory distinction between cyanoacrylate products is clinically relevant. Currently, only SecurePortIV is licensed for use in vascular catheter securement.[20] This formulation differs significantly from topical cyanoacrylate adhesives intended for wound closure in terms of its chemical formulation, polymer strength, flexibility, polymerisation time and safety profile.[19 20]

The use of cyanoacrylate glue for peripheral and central vascular access catheter securement has been reported in NICUs in Europe, North America, Australia and the Middle East,[6 7 21–26] reflecting growing international interest in this approach, although practices remain heterogeneous and implementation varies between settings. In parallel, international infusion and vascular access guidelines[6 8 24] acknowledge cyanoacrylate adhesives as a catheter securement option in selected clinical contexts, including neonatal care, while emphasising appropriate product selection, careful application and the evolving nature of the evidence base. Within this context, the present study adds pragmatic clinical data by comparing cyanoacrylate glue with splint-based stabilisation for SPCs in neonates, without implying guideline endorsement or standard-of-care status.

In the neonatal vascular access literature, the use of cyanoacrylate adhesives for catheter securement has generally been associated with a favourable safety profile, with no consistent reports of clinically significant adverse effects when catheter-specific formulations are used appropriately.[19 23 27 28] However, data remain limited for extremely preterm infants, and further prospective research is warranted to better characterise safety and optimal application in this particularly vulnerable population.

Despite the relatively smaller sample size in the splint+glue group, this fixation method was consistently associated with favourable outcomes, including enhanced catheter stability, reduced complication rates and higher therapy completion. However, these outcomes should be viewed in the context of existing evidence highlighting that splint-only stabilisation is not only generally less effective but also potentially harmful in neonates,[10–17] factors that strongly favour the adoption of glue securement into routine care.[26]

The accidental dislodgement rate observed in the splint+glue group (1.5%) was lower than that in the splint and glue groups. This finding, despite the limited sample size, suggests a potential synergistic benefit of combining mechanical and adhesive fixation strategies. Furthermore, multivariable analysis demonstrated that the lower incidence of phlebitis among glue users was not explained by differences in gestational age, birth weight or insertion site. Furthermore, the combined method was associated with lower phlebitis rates and comparable or improved therapy completion compared with either method used in isolation. Although the mean dwell time did not differ substantially among the groups, Kaplan–Meier survival analysis identified a clear advantage in catheter longevity in the splint+glue group.

These findings imply a cumulative stabilising effect when glue is employed alongside splinting. Speculatively, this benefit might be brought about by a reduction in micro-displacement at the insertion site, thereby reducing mechanical phlebitis and the risk of accidental removal.

Nonetheless, existing literature has highlighted valid concerns regarding the use of splints in neonates, including the risk of pressure injury, impaired limb mobility and potential delays in recognising early signs of complications such as infiltration or phlebitis.[2 3 10–13] These clinical weaknesses may partly explain the low utilisation of splints in contemporary neonatal practice. The current data, however, indicate that the application of cyanoacrylate glue may compensate for some of these drawbacks by reinforcing fixation, improving site visibility and reducing mechanical stress on surrounding tissues.

It is important to consider our results in context. Although this was a single-centre study, the large cohort size (n=45 754 SPCs) strengthens the robustness and clinical relevance of the findings. In addition, the cyanoacrylate adhesive evaluated (SecurePortIV) is currently the only formulation specifically indicated for vascular catheter securement with both FDA approval and CE marking, thereby limiting variability related to product selection. This study used one proprietary design of splint, and the dedicated vascular access team (NeoVAT) ensured that protocols for their use were applied consistently across the study groups. This detail might affect the certainty with which these results could be applied in other settings. It might be that the sometimes-contradictory outcomes reported by studies using splints might be explained by unaccounted-for confounding variables that do not feature in the study setting's practice. For example, different designs and materials of splints, together with differing use protocols or inconsistent application, could create unreliability.

Cyanoacrylate glue was associated with the longest dwell times and the lowest incidence of phlebitis, without an increased risk of dislodgement or infiltration. Dislodgement rates were comparable in the unadjusted analysis across the groups. However, multivariable analysis demonstrated that increasing gestational age and weight at the time of catheter insertion were independently associated with a higher risk of dislodgement. This likely reflects increased infant mobility rather than device-related factors. The combined use of splint and cyanoacrylate glue was independently associated with a reduced risk of dislodgement. Glue alone was associated with lower odds of dislodgement compared with splint-only stabilisation, although the magnitude of this effect was smaller than that observed for the combined strategy. The markedly higher phlebitis rate in the splint group could be attributed to the rigidity of the fixation device.[2 13 14] However, the absence of adhesive-based stabilisation might have also contributed to the higher incidence of phlebitis. Previous studies have shown that cyanoacrylate glue enhances catheter stability and contributes to reduced local inflammation by minimising micro-movements at the insertion site.[19–22 26] This observation might account for the significantly lower phlebitis rates observed among glue users. These findings were supported by multivariable analysis, which confirmed that the lower incidence of phlebitis among glue users was not explained by differences in gestational age, birth weight or insertion site.

Catheter material and design were not analysed in the current study. However, a previous analysis by our group reported that PUR SPC use was associated with lower phlebitis rates and longer dwell time when compared with PCTFE SPCs in neonates.[29] There is very limited non-proprietary information available about the relative merits of winged or straight SPCs in the neonatal population beyond their effect on user proficiency and first insertion success rates. A systematic review and meta-analysis reported statistically insignificant differences in the incidence of phlebitis or catheter dislodgement between winged or straight devices.[30] However, these results should be interpreted with caution and are of limited utility for neonatal populations. The authors report that the included studies were inconsistent in their definitions of complications, such as phlebitis, and the specific design of SPCs differed between studies. Additionally, no studies included neonates in their study population, a patient group widely known to have unique needs in relation to vascular access device stabilisation.[1 2 6 7 30] Consequently, further robust prospective studies are needed to examine the utility of newer catheter materials and SPC designs when used in real-world practice settings to better inform clinicians about optimal SPC selection and their use in specific clinical circumstances.

In summary, this study contributes to the growing body of evidence supporting the safety and efficacy of cyanoacrylate-based securement methods in neonates and provides new insights into the combined application of glue and splinting. Although this dual stabilisation strategy approach appears particularly promising, further research is required to explore long-term outcomes, cost-effectiveness and user-centred metrics.

Study limitations

This was a single-centre study, and the clinical practices employed during the study may not reflect how SPCs are inserted and managed in other units. Furthermore, the choice of SPC material and design used in this study may not reflect their availability in other settings, which could limit the generalisability of the results across different clinical environments. The effects of these potentially confounding variables should be explored in future prospective studies.

Nevertheless, the study benefited from a large sample size (>45 000 SPCs), which enhances statistical power and supports the robustness of the findings. Furthermore, the study was conducted within a standardised vascular access protocol and benefited from minimal procedural

heterogeneity, and no participants were excluded because of incomplete data.

However, limitations inherent to the retrospective design include susceptibility to selection bias and the absence of randomisation. The comparatively smaller number of participants in the splint+glue group may have constrained the detection of smaller effect sizes. Furthermore, important variables such as pain perception, procedural ease and clinician satisfaction were not assessed and warrant investigation in future prospective trials. Targeted future research should focus on infants of extremely low birth weight, where fixation challenges are most pronounced. Incorporating economic evaluations and caregiver-reported outcomes may facilitate broader clinical adoption of glue-based fixation strategies in neonatal intensive care settings. Although multivariable adjustment was performed for key clinical variables, residual confounding cannot be excluded, and the absence of patient-level identifiers prevented adjustment for within-infant clustering.

CONCLUSION

Stabilising SPCs in neonates remains challenging for many reasons. Traditional splinting methods can cause skin injury, restrict postural movement and delay the detection of complications. Cyanoacrylate glue has been proposed as an alternative or adjunct for SPC securement, but clinical evidence has to date been limited. This study suggests that cyanoacrylate glue, when used as a standalone method for stabilising SPCs in neonates, is a safe and effective approach associated with a lower incidence of phlebitis. No increase in dislodgement was observed after adjustment, and when combined with splinting, cyanoacrylate glue was associated with a reduced risk of dislodgement. Additionally, there are some elements of improved performance over using splints, such as a reduced incidence of complications like phlebitis. Further prospective studies are warranted to evaluate long-term outcomes, cost-effectiveness and user experience. Nonetheless, this large retrospective cohort study provides robust observational evidence to inform clinical practice and supports the broader integration of medical-grade catheter adhesives into neonatal vascular access protocols.

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