La colla in cianoacrilato per PICC/CICC/FICC

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Bambino Gesù
OSPEDALE PEDIATRICO

Cianoacrilato - Colla istoacrilica

L'introduzione della colla istoacrilica nella pratica clinica degli accessi venosi è stato uno dei cambiamenti più importanti dell'ultimo decennio.

Cianoacrilato - Colla istoacrilica

ha diversi potenziali vantaggi in termini di

- **stabilizzazione del catetere,**
- **riduzione del sanguinamento locale,**
- **protezione del sito di uscita dalla contaminazione batterica,**
- **chiusura senza suture di piccole incisioni cutanee**

Il fissaggio ideale:

- Ridurre i movimenti dell'accesso vascolare all'interno del vaso (pistoning; "in and out")
- Ridurre i movimenti dell'accesso vascolare all'esterno (mantenendolo nella vena)
- Fornire una barriera alla contaminazione batterica
- Facilitare la traspirazione della cute (alto MVTR specie nel neonato pretermine)
- Prevenire il sanguinamento
- Garantire una chiara e semplice valutazione del sito di inserzione
- Minimizzare il trauma sulla cute
- Essere comfortevole
- Poco costoso
- Facile da applicare

- Tissue adhesive for vascular access devices: who, what, where and when? Amanda Corley. British Journal of Nursing, 2017

La colla: cianoacrilato

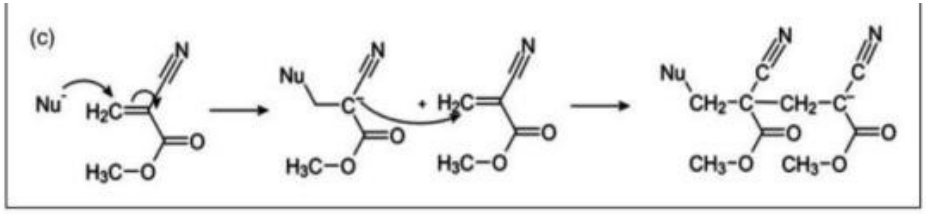


Figure 2. Molecular structure of cyanoacrylate and the polymerization process (adapted from Pollak and White[18]). (a) Monomeric cyanoacrylate $CH_2{=}C(CN){-}COOR$. The R represents an alkyl group. (b) *n*-Butyl-2-cyanoacrylate (*n*-BCA). The carboxyl ethyl ($-COOH-CH_2-CH_2$) group is the antigenic component of the molecule. (c) Polymerization process of cyanoacrylate (CA). Exposure of CA monomers to an anion, such as the hydroxyl ($-OH$) group in water initiates the polymerization process with bonding of the ethylene units.

La polimerizzazione è una reazione esotermica. Durante la formazione del polimero si genera calore con temperature che possono arrivare anche a 40-45°C

La colla: cianoacrilato

- Possiede un'alta resistensa alla trazione (tensile strength)
- Stabilizza il catetere riducendo i movimenti "in and out"
- Potenzialmente reduce il danno endoteliale e il rischio di trombosi
- Sigilla il sito di inserzione prevenendo il sanguinamento e l'ingresso dei microrganismi (colonizzazione extraluminale)
- Proprietà batteriostatica

Cyanoacrylate tissue adhesives for securement have been studied in vitro, in animals, and in small pilot trials of peripheral venous and arterial catheters. Tissue adhesive plus a standard transparent dressing have shown a slight trend toward reduction in catheter failure with these adhesives in combination with a standard transparent membrane dressing; however, larger trials are needed to confirm these findings and identify patients for whom this might not be suitable.[5,15-17] (III)

INS 2021

Tissue adhesive for vascular access devices: who, what, where and when? Amanda Corley. British Journal of Nursing, 2017

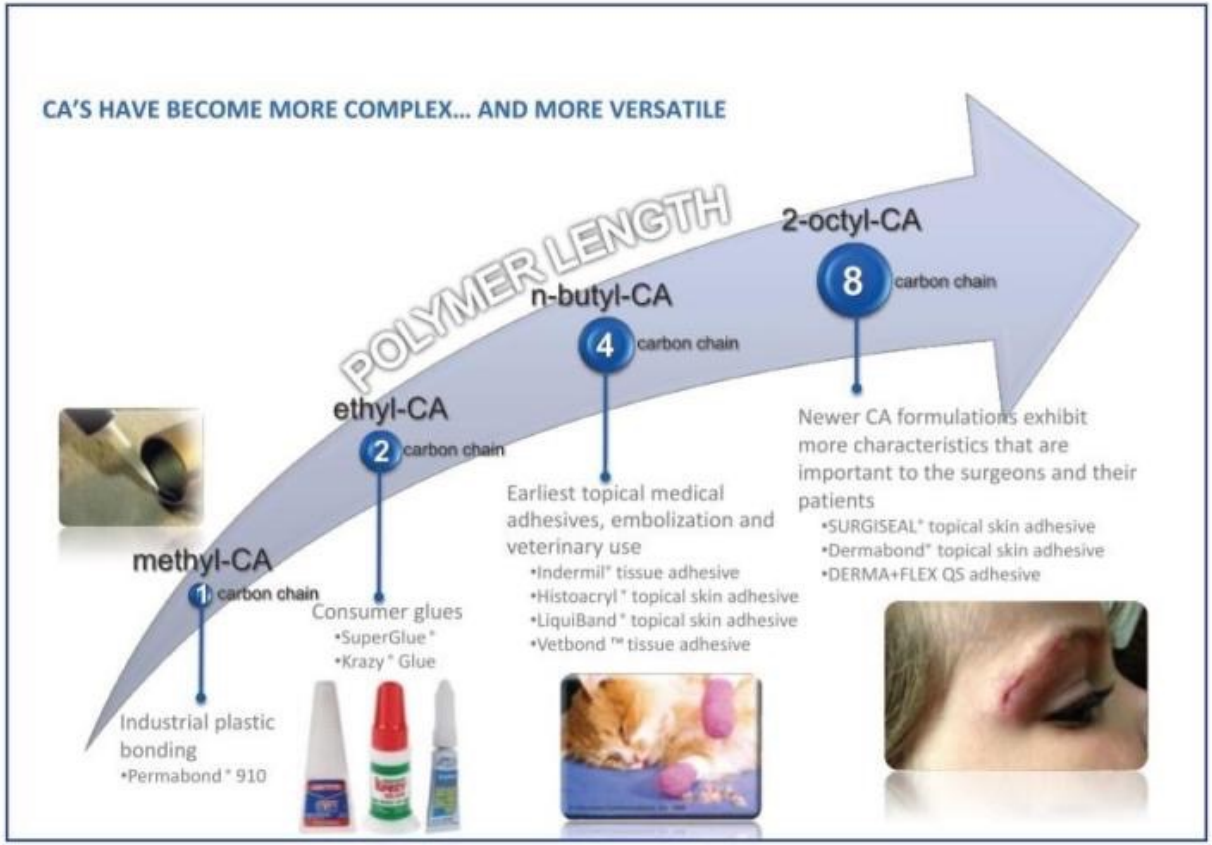


Figure 1. Cyanoacrylate development

Table 1. Comparison of older and newer cyanoacrylate tissue adhesives	
First generation	**Second generation**
Butyl-cyanoacrylate (BCA)	**2-octyl-cyanoacrylate (OCA)**
Quick drying	Longer drying time
Rigid/brittle	Higher tensile strength and more flexible
More cytotoxic	Less cytotoxic
Stronger thermal reaction	Reduced thermal reaction
Requires minimum 24 hours before fully water resistant	Immediately water resistant

Source: Internal testing by Adhezion Biomedical

Table 1. A selection of tissue adhesives used for skin closure or with vascular access devices*

Brand name (manufacturer)	Chemical constitution	Presentation (ml)	Storage (Celsius)	Time to degradation (days)	Properties
Histoacryl/Histoacryl Blue (B.Braun, Melsungen, Germany)	NBCA	0.5	< 22	7–10	■ High tensile strength ■ Microbial barrier ■ Quick setting time
Histoacryl Flexible (B.Braun, Melsungen, Germany)	NBCA + softener	0.5	< 25	7–10	■ High tensile strength ■ More flexible than NBCA ■ Less heat production on application ■ Microbial barrier
Dermabond (Ethicon, Somerville, NJ, USA)	OCA	0.36, 0.7	< 30	5–10	■ Higher tensile strength than NBCA ■ More flexible than NBCA ■ Microbial barrier
Surgiseal/SecurePortIV (Adhezion Biomedical, Wyomissing, PA, USA)	OCA	0.35, 0.5 (Surgiseal) 0.15 (SecurePortIV)	< 30	5–10	■ Higher tensile strength than NBCA ■ More flexible then NCBA ■ High moisture vapour transmission rate ■ Microbial barrier
Glubran Tiss2 (GEM, Viareggio, Italy)	NBCA + OCA	0.25, 0.35, 0.5	0–4	5–8	■ Improved flexibility ■ High tensile strength ■ Breathable ■ Less heat production on application ■ Microbial barrier
Indermil flexifuse (Connexicon, Dublin, Ireland)	NBCA + OCA	0.75	4–30	5–8	■ Flexibility ■ High tensile strength ■ Minimal heat produced ■ Microbial barrier

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

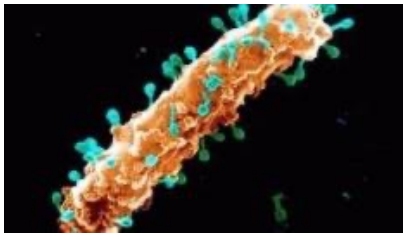
Form Approved: OMB No. 0910-0120
Expiration Date: January 31, 2017
See PRA Statement below.

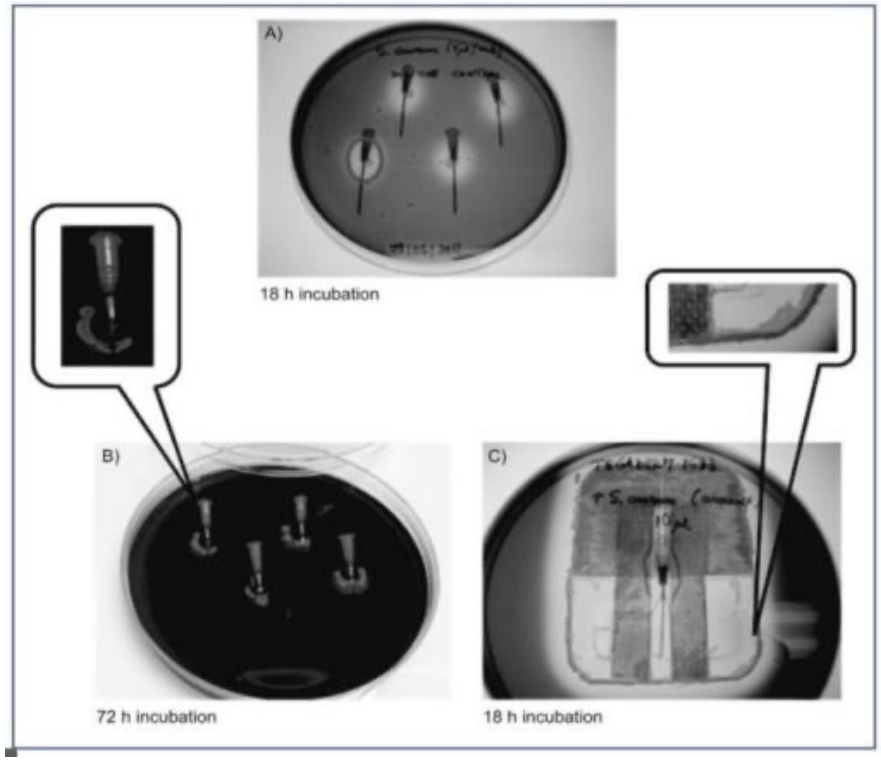
510(k) Number *(if known)*
K170505

Device Name
SecurePortIV Catheter Securement Adhesive

Indications for Use *(Describe)*
SecurePortIV™ catheter securement adhesive is to be applied as a film forming securement and sealant at the point of vascular access catheter skin entry. The film holds the catheter to the skin to reduce catheter movement, migration, and/or dislodgment. It is used to protect the catheter skin entry site by creating a sealant that immobilizes surface bacteria, preventing them from entering into the catheter skin entry site while also providing a moisture barrier. SecurePortIV™ is intended to be used with a transparent film dressing on short-term and long-term vascular access catheters including peripheral IVs, PICCs, and CVCs.

Azione antibatterica…BCA





Simonova G. Cyanoacrylate tissue adhesives—effective securement technique for intravascular catheters: in vitro testing of safety and feasibility. Anaesth Intensive Care. 2012;40(3):460–466

Azione antibatterica…OCA

Table 1
Antibacterial effect of the uninitiated product after a 3-minute contact time: detailed results versus *Pseudomonas aeruginosa*

Replicate No.	Log 10 survivors	Log 10 reduction	Neutralization challenge
1-19	0	8 – 0 = 8	+
20	1.48 = 1	8 – 1 = 7	+
P aeruginosa versus negative control			
Dilution		Count	
10^{-4}		TNTC, TNTC	
10^{-5}		>200, >200	
10^{-6}		27, 58	
10^{-7}		5, 3	
cfu/10 mL		4.3×10^7	
Log 10		7.63 = 8	
Summary of kill against 7 clinically relevant organisms		Average (n = 20) log 10 reduction	
Methicillin-resistant Staphylococcus aureus		8	
Escherichia coli		8	
P aeruginosa		8	
Klebsiella pneumoniae		7	
Staphylococcus epidermidis		7	
Corynebacterium pseudodiphtheriticum		8	
Staphylococcus aureus		8	

NOTE. The filtrates were also plated and had no growth. The results for all organisms were equivalent as shown above. On challenge with <100 cfu, all dilution tubes were positive, meaning no carryover residual cyanoacrylate was present in the dilution tubes. The results for all the eight organisms tested were equivalent having ≥7 log kill.
+, positive; cfu, colony forming units; TNTC, too numerous to count.

Prince D, Solanki Z, Varughese R, Mastej J, Prince D. Antibacterial effect and proposed mechanism of action of a topical surgical adhesive. Am J Infect Control. 2017.

Azione emostatica

- Incidenza di sanguinamento nel posizionamento dei PICC: 40% ad 1 h, e 15% a 25 h.
- L'uso costante della colla in cianoacrilato abbatte l'incidenza di sanguinamento (0%) ad 1 e 25 h dal posizionamento del CVC
- Questo ha un notevole impatto logistico e sui pazienti.

Elimination of the 24-hour dressing: a quick win

be inspected. It is, however, common practice to apply gauze over the insertion site initially to absorb any post-insertion bleeding. A 24-hour, post-insertion dressing would then be applied (Royal College of Nursing, 2016). By using tissue adhesive, it is possible to eliminate the need for this 24-hour, post-insertion dressing as haemostasis can be achieved before the transparent film dressing is applied.

Scoppettuolo. Anaesthesia 2015

Cyanoacrylate tissue adhesive: a new tool for the vascular access toolbox. Jackie Nicholson. British Journal of Nursing, 2019

The Art and Science of Infusion Nursing

A Revolutionary, Proven Solution to Vascular Access Concerns: A Review of the Advantageous Properties and Benefits of Catheter Securement Cyanoacrylate Adhesives

Sheng Zhang, PhD • Bethany S. Lingle, BS • Shannon Phelps, BS

Catheter type	Securement method	Securement strength (N)
BD Autoguard catheter	CSCAs	12.473
	Tegaderm 1683	8.283
	Opsite	3.216
	HubGuard	2.905
	Durapore	3.381
BD Nexiva catheter	CSCAs	13.380
	Tegaderm 9525HP	7.090
	Opsite	1.392
	HubGuard	1.552
	Durapore	1.348

Abbreviations: CSCAs, catheter securement cyanoacrylate adhesives; N, newton.

Catheter Type	Securement Method	Securement Strength (N)
BD Autoguard catheter	CSCAs + Tegaderm 1683	19.501
	CSCAs + Opsite	15.453
	CSCAs + HubGuard	12.451
	CSCAs + Durapore	12.362
BD Nexiva catheters	CSCAs + Tegaderm 9525HP	14.893
	CSCAs + Opsite	16.000
	CSCAs + HubGuard	10.840
	CSCAs + Durapore	15.035

Abbreviations: CSCAs, catheter securement cyanoacrylate adhesives; N, newton.

Ten years of clinical experience with cyanoacrylate glue for venous access in a 1300-bed university hospital

Mauro Pittiruti, Maria Giuseppina Annetta, Bruno Marche, Vito D'Andrea and Giancarlo Scoppettuolo

Table 1. Italian Group of Long-Term Venous Access Devices recommendations on the use of glue in venous access

1. Use cyanoacrylate glue

- As an additional securement of peripheral venous access devices at a high risk of dislodgement

  Particularly in peripheral catheters with expected duration >48 hours

- For sealing the exit site of any central venous access device soon after insertion to avoid post-procedural local bleeding, prevent unscheduled dressing changes and protect the exit site from bacterial contamination during the first week

  Use chlorhexidine-releasing sponge dressing (in non-tunnelled central catheters) after the first week

- For closing any skin incision related to venous access procedures (skin incisions for tunnelling or for subcutaneous port placement)

  Never use stitches

2. Remember to prefer butyl-cyanoacrylate or octyl-butyl-cyanoacrylate

3. Use a minimal amount of cyanoacrylate glue and only at the time of insertion

Targeting zero catheter-related bloodstream infections in pediatric intensive care unit: a retrospective matched case-control study

The Journal of Vascular Access
2018, Vol. 19(2) 119–124
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Daniele G. Biasucci[1], Mauro Pittiruti[2], Alessandra Taddei[3], Enzo Picconi[1], Alessandro Pizza[1], Davide Celentano[1], Marco Piastra[1], Giancarlo Scoppettuolo[4], Giorgio Conti[1]

TABLE I - Insertion and maintenance bundle adopted in the group of cases

Insertion and maintenance bundle	Cases	Controls
1. Hand washing and maximal barrier precautions	Yes	Yes
2. Skin antisepsis with 2% chlorhexidine	Yes	Yes
3. Ultrasound pre-puncture evaluation through RaCeVA	Yes	No
4. Ultrasound guided venipuncture	Yes	Yes
5. Tunneling of the catheter so to obtain an exit site in the infraclavicular area	Yes	No
6. Sealing of the exit site with glue	Yes	No
7. Securement with sutureless device	Always	Inconsistently
8. Coverage with transparent semipermeable dressing	Yes	No
9. Chlorhexidine-impregnated sponges	After the 1st week	Since insertion
10. Use of neutral NFC and port protectors	Yes	Yes
11. Simulation-based standardized training program	Yes	No

RaCeVA = rapid central vein assessment; NFC = needle free connectors.

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TABLE III - Punctured veins at different sites

Veins	Cases	Controls
Right internal jugular vein at mid-neck, n (%)	0 (0%)	40 (62.5%)
Low lateral right internal jugular vein, n (%)	2 (3.12%)	11 (17.2%)
Left internal jugular vein at mid-neck, n (%)	0 (0%)	13 (20.3%)
Left brachiocephalic vein, n (%)	2 (3.12%)	0 (0%)
Right brachiocephalic vein, n (%)	52 (81.25%)	0 (0%)
Right axillary vein, n (%)	4 (6.25%)	0 (0%)
Left subclavian vein, n (%)	2 (3.12%)	0 (0%)
Right external jugular vein, n (%)	2 (3.12%)	0 (0%)

TABLE IV - Complication rates from insertion to PICU discharge

		Cases	Controls
Indwelling time (d)	Total	648	503
	Mean (±SD)	9.7 ± 3.1	7.5 ± 3.5
CR-BSI	No	1	8
	per 1000 catheter days	1.5	15
CR-DVT	No	0	1
Accidental dislodgements	No	0	3

CR-BSI = catheter-related bloodstream infections; CR-DVT = catheter-related deep vein thrombosis; PICU = pediatric intensive care unit; SD = standard deviation.

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- **chiusura senza suture di piccole incisioni cutanee**

STABILIZZAZIONE DEL CATETERE

Stabilizzazione del catetere

- 2007 Wilkinson et al. – Anaesthesia - ***Tissue adhesive as an alternative to sutures for securing central venous catheters*** Glue as securement for **central venous access devices**

- 2012 Simonova et al. – Anaesth Int Care ***Cyanoacrylate tissue adhesives—effective securement technique for intravascular catheters: in vitro testing of safety and feasibility*** In vitro study: glue is more effective than polyurethane dressing as securement

- 2014 Edwards et al. – Crit Care Resusc ***A pilot trial of bordered polyurethane dressings, tissue adhesive and sutureless devices compared with standard polyurethane dressings for securing short-term arterial catheters*** Pilot study: cyanoacrylate glue as securement of **peripheral arterial catheters**

Stabilizzazione del catetere

- 2015 Marsh et al. – J Vasc Access ***Securement methods for peripheral venous catheters to prevent failure: a randomised controlled pilot trial*** Clinical randomized pilot study: cyanoacrylate glue is effective as securement of **short peripheral intravenous cannulas**.

- 2015 Reynolds et al. – Aust Crit Care ***Novel technologies can provide effective dressing and securement for peripheral arterial catheters: a pilot randomized controlled trial in the operating theatre and the intensive care unit.*** Clinical randomized pilot study: cyanoacrylate glue is effective as securement as **peripheral arterial catheters**.

- 2016 Bugden et al. – Ann Emerg Med ***Skin glue reduces the failure rate of emergency department-inserted peripheral intravenous catheters: a randomized controlled trial*** Clinical randomized study: cyanoacrylate glue is effective as securement of **short peripheral intravenous cannulas**, reducing the risk of dislodgment

Stabilizzazione del catetere

- 2016 Rickard et al. – J Crit Care ***A 4-arm randomized controlled pilot trial of innovative solutions for jugular central venous access device securement in 221 cardiac surgical patients*** Clinical randomized study: cyanoacrylate glue alone is not effective as securement of **CICCs** inserted in the internal jugular vein.

- 2017 Corley et al. – Brit J Nurs ***Tissue adhesive for vascular access devices: who, what, where and when?*** Review of clinical studies, mainly focused on cyanoacrylate glue as securement.

- 2017 Marsh et al. – Int J Nursing Stud ***Devices and dressings to secure peripheral venous catheters: A Cochrane systematic review and meta-analysis*** Cochrane review discussing different strategies of securement of **short peripheral intravenous cannulas**: inconclusive.

Stabilizzazione del catetere

- 2017 Chan et al. – Trials ***Central venous Access device SeCurement And Dressing Effectiveness for peripherally inserted central catheters in adult acute hospital patients (CASCADE): a pilot randomised controlled trial*** Clinical pilot study, investigating different strategies of securement for **PICCs**: inconclusive. Cyanoacrylate glue alone not so effective.

- 2017 Ullman et al. – BMC Cancer ***Innovative dressing and securement of tunneled central venous access devices in pediatrics: a pilot randomized controlled trial*** Clinical pilot study, investigating different strategies of securement for **tunneled central VADs**: inconclusive. Cyanoacrylate glue was apparently effective and safe.

- 2018 Rickard et al. – Lancet ***Dressings and securements for the prevention of peripheral intravenous catheter failure in adults (SAVE): a pragmatic, randomised controlled, superiority trial*** Clinical randomized study comparing different strategies of securement of **short peripheral intravenous cannulas**: inconclusive. Skin adverse reactions reported for cyanoacrylate glue.

Stabilizzazione del catetere

- 2020 Mitchell et al. – Austr Crit Care ***Central venous access device securement and dressing effectiveness: the CASCADE pilot randomised controlled trial in the adult intensive care*** Clinical randomized pilot study, investigating different strategies of securement for **central VADs**: inconclusive. Cyanoacrylate glue alone is not so effective.

- 2020 Barone et al. – J Vasc Access **Epicutaneo-caval catheters in neonates: new insights and new suggestions from the recent literature** Review of current management of **ECC**, reporting unpublished data about the safety and efficacy of cyanoacrylate glue as securement of **ECC** in neonates.

- 2020 Kleidon et al. – J Tissue Viability ***SMILE - Secure My Intravenous Line Effectively: a pilot randomized controlled trial of peripheral intravenous catheter securement in pediatrics.*** Clinical randomized pilot study comparing different strategies of securement of **short peripheral intravenous catheters** in children. Inconclusive, though cyanoacrylate glue was apparently effective in reducing catheter failure.

Stabilizzazione del catetere

- 2020 Guido et al. – J Vasc Access ***An innovative cyanoacrylate device developed to improve the current standard of care for intravascular catheter securement*** In vitro study supporting the effectiveness of cyanoacrylate glue as securement of VADs.

- 2021 D'Andrea et al. –J Vasc Access ***Use of cyanoacrylate glue for the sutureless securement of Epicutaneo-Caval Catheters in neonates*** Clinical retrospective study in 92 neonates with **ECC**: cyanoacrylate glue was completely safe and highly effective as securement of ECC.

- 2021 Bahl et al. – J Vasc Access ***Short peripheral intravenous catheter securement with cyanoacrylate glue compared to conventional dressing: A randomized controlled trial*** Randomized study showing that CG + transparent dressing improves the survival of **short peripheral cannulas**.

Stabilizzazione del catetere

RIDUZIONE DEL SANGUINAMENTO

Riduzione del sanguinamento

- 2012 Pittiruti et al. – abstract at WoCoVA - ***Cyanoacrylate glue prevents early bleeding of the exit site after PICC placement*** Clinical study on glue in 45 **PICC** insertions: 100% effectiveness in avoiding local bleeding

- 2013 Scoppettuolo et al. – Critical Care ***Cyanoacrylate glue prevents early bleeding of the exit site after CVC or PICC placement*** Clinical study on 65 **central VADs**: glue avoids bleeding at 1 hr and 24 hrs after insertion in 100% of cases

- 2013 Annetta et al. – abstract at AVA ***Randomized clinical study on the efficacy of metallic powder vs. cyanoacrylate glue in sealing the exit site of peripherally inserted central catheters*** Clinical randomized study on **PICCs** in ICU: both cyanoacrylate and metallic powder (Bioseal) were effective in reducing local bleeding and avoiding bacterial contamination of the exit site (though cyanoacrylate was more cost-effective and better tolerated)

Riduzione del sanguinamento

- 2015 Scoppettuolo et al. – Anaesthesia ***Further benefits of cyanoacrylate glue for central venous catheterization*** Clinical study: sealing the exit site of **PICCs** with cyanoacrylate glue reduces local bleeding from 40% to 0%.

- 2016 Pittiruti et al. – abstract at AVA ***Cyanoacrylate glue and central venous access device insertion*** Clinical retrospective study: cyanoacrylate glue used for sealing the exit site in 513 **non-tunneled central VADs** (for the purpose of avoiding bleeding at the exit site), in 114 **tunneled central VADs** (for avoiding bleeding + skin closure at the tunneling site) and in 802 **ports and PICC-ports** (for skin closure). 100% effectiveness and 100% safety

- 2017 Kleidon et al. – J Vasc Interv Radiol ***A pilot randomized controlled trial of novel dressing and securement techniques in 101 pediatric patients*** Randomized clinical study: cyanoacrylate glue is effective in reducing local bleeding after **PICC** insertion in children.

Riduzione del sanguinamento

- 2020 Gilardi et al. – J Vasc Access ***Reduction of bacterial colonization at the exit site of peripherally inserted central catheters: a comparison between chlorhexidine-releasing sponge dressings and cyano-acrylate*** Clinical randomized study on **PICCs**, comparing cyanoacrylate glue vs. biopatch. Both strategies were effective in controlling bacterial colonization. Though, glue was also effective in reducing local bleeding, reducing unscheduled dressing change, and it was more cost-effective than sponge dressing.

PROTEZIONE DALLA CONTAMINAZIONE BATTERICA

Protezione dalla contaminazione batterica

- 2008 Wilkinson et al. – Anaesthesia - ***The antimicrobial effect of Histoacryl skin adhesive*** Antimicrobial activity of octyl-cyanoacrylate

- 2013 Annetta et al. – abstract at AVA ***Randomized clinical study on the efficacy of metallic powder vs. cyanoacrylate glue in sealing the exit site of peripherally inserted central catheters*** Clinical randomized study on **PICCs** in ICU: both cyanoacrylate and metallic powder (Bioseal) were effective in reducing local bleeding and avoiding bacterial contamination of the exit site (though cyanoacrylate was more cost-effective and better tolerated)

- 2017 Biasucci et al. –J Vasc Access ***Targeting zero catheter-related bloodstream infections in pediatric intensive care unit: a retrospective matched case-control study*** Retrospective controlled clinical study: a bundle for avoiding extraluminal bacterial contamination of **central VADs** (cyanoacrylate glue + sutureless device + tunneling + transparent dressing) is associated with a 90% reduction of CRBSI in pediatric intensive care unit.

Protezione dalla contaminazione batterica

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Original research article

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Reduction of bacterial colonization at the exit site of peripherally inserted central catheters: A comparison between chlorhexidine-releasing sponge dressings and cyano-acrylate

Emanuele Gilardi[1], Alfonso Piano[1], Pietro Chellini[1], Barbara Fiori[2], Laura Dolcetti[3], Mauro Pittiruti[4] and Giancarlo Scoppettuolo[3]

Results: A total of 51 patients were enrolled in each group. In 42 patients the second skin culture was not performed because of 20 patients were lost at follow-up or deceased and in 22 patients the dressing needed to be changed early, because of local bleeding (13 cases, in group B) or because of dressing detachment (four in group A and five in group B). The microbiological study was completed in 36 patients in group A and 24 in group B. No microorganisms were isolated in any patient.

Conclusions: Both strategies were effective in controlling bacterial colonization. Glue was effective in reducing local bleeding, and it was more cost-effective than sponge dressing. During the first week, when local bleeding and bacterial colonization must be prevented, glue might be more appropriate than chlorhexidine-releasing dressing; after the first week chlorhexidine-releasing dressing might be preferable, considering that the safety of glue application on the skin for prolonged periods is still questionable.

SINTESI DI PICCOLE INCISIONI CUTANEE

Sintesi di piccole incisioni cutanee

- 2016 Pittiruti et al. – abstract at AVA ***Cyanoacrylate glue and central venous access device insertion*** Clinical retrospective study: cyanoacrylate glue used for sealing the exit site in 513 **non-tunneled central VADs** (for the purpose of avoiding bleeding at the exit site), in 114 **tunneled central VADs** (for avoiding bleeding + skin closure at the tunneling site) and in 802 **ports and PICC-ports** (for skin closure). 100% effectiveness and 100% safety

- 2017 Martin et al. – J Vasc Interv Radiol **Randomized controlled trial of octyl cyanoacrylate skin adhesive versus subcuticular suture for skin closure after implantable venous port placement.** Clinical randomized study: cyanoacrylate glue is effective and safe for skin closure after **port** insertion.

A summary of the evidence

- Glue is effective for securement only for short peripheral cannulas and epicutaneo-cava catheters and when used with a transparent semipermeable membrane
- At all central venous access devices, glue is effective in minimising local bleeding and is cost-effective as it reduces unscheduled dressing changes
- Glue is probably effective in minimising bacterial contamination for all central venous access devices but should be used only in the first week as replacing it every week may be harmful
- To close skin incisions, glue is effective and cost-effective for all venous access procedures

GRAZIE PER L’ATTENZIONE