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Coordinator of a Multi-professional Vascular Access Team

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Co-founder and president of GAVeCeLT (The Italian Group of Venous Access Devices)

Co-founder of WoCoVA Foundation (World Conference on Vascular Access)

Cyanoacrylate glue

Glue

One of the most relevant novelties of the last two years in the field of VADs:

- 100% control of bleeding from the exit site
- Improved securement for at least 7 days
- Sealing of the exit site against the risk of extraluminal contamination

Glue = protection of the exit site

- From bleeding
- From bacterial contamination
- From dislodgment

One of the first report in the literature:

Cyanoacrylate glue prevents early bleeding of the exit site after PICC placement

M.Pittiruti, G.Scoppettuolo, and A.Emoli

WoCoVA ***2012*** *– Abstract published on JVA*

Background

In our hospital, the rate of significant local bleeding after placement of PICCs *without reverse tapering* may be as high as 40% at 1 hour and 15% at 24 hrs.

Method

- The aim of this pilot study was to verify the efficacy of cyanoacrylate glue in reducing the risk of early bleeding at the exit site after PICC placement.
- We studied a group of adult patients consecutively undergoing placement of silicon and polyurethane PICCs without reverse tapering, in a non-intensive ward of our Hospital.

Method (2)

We adopted the same inexpensive cyano-acrylate glues commonly used for sutureless skin repair.

The glue was used on the exit site, at the end of the procedure, soon after the securement with a sutureless device, before dressing the wound.

Method (3)

- Two minutes after placement of the glue, the exit site was covered with a temporary gauze dressing, which was replaced by transparent dressing at 24 hrs.
- All patients were assessed at 1 hour and at 24 hours.

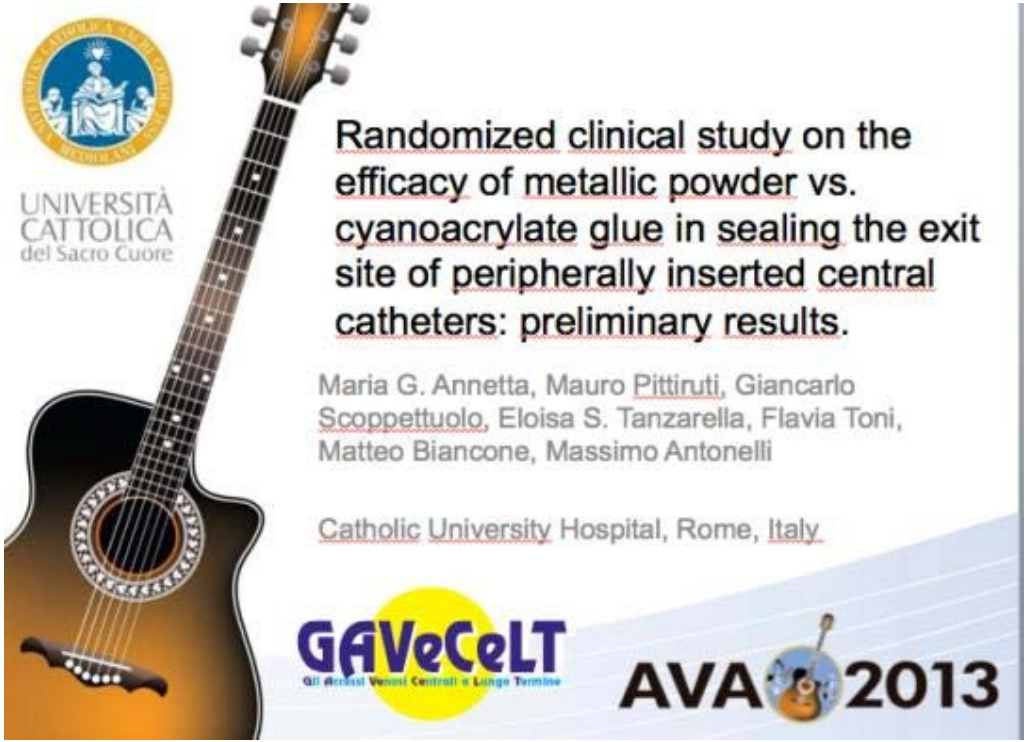
Results

- In 45 consecutive patients, there was no significant local bleeding at 1 hour or at 24 hours after PICC placement.
- No local adverse reaction occurred.

Conclusion

- Glue is a safe, inexpensive and highly effective tool for avoiding the risk of early bleeding of the exit site after PICC placement.

A second study from our group was presented at AVA the following year, 2013



Goal of the study

- The aim of our study was to verify and compare the efficacy of metallic powder seal vs. cyanoacrylate glue in reducing the **risk of early bleeding** at the exit site after PICC placement.
- Other possible beneficial effects of *sealing* were also investigated:
  - Protection from the **risk of extraluminal contamination** (by reducing the entrance of bacteria in the space between the catheter and the skin)
  - Protection from the **risk of dislocation** (by increasing the stability of the catheter inside the skin breach).

Method

- We studied exclusively **non-tunneled, open-ended, power injectable polyurethane PICCs** (5Fr double lumen or 6Fr triple lumen, *without reversed tapering)*, inserted in adult patients of our ICU.
- All PICCs were inserted according to the same protocol (**SIP Protocol**, GAVeCeLT), which includes 2% chlorhexidine antisepsis, maximal sterile barriers, ultrasound guidance, EKG guidance and securement with sutureless device.

Method (2)

Patients were randomized in **two** groups.

At the end of the procedure, soon after the securement with a sutureless device, before dressing the wound, either metalic powder seal (**Group A**) or cyanoacrylate glue (**Group B**) was applied over the exit site.

Method (3)

Two minutes after placement of the seal or of the glue, the exit site was covered with a temporary dressing, which was replaced by a transparent dressing at 24 hrs.

All patients were assessed at 1 hr, at 24 hrs and every 7 days for ruling out the presence of bleeding, dislocation, or local infection.

All catheters were removed or replaced over guidewire after 3 weeks, according to the following technique:

> Removal of the dressing - skin antisepsis - 30 seconds to let chlorhexidine dry - removal of the catheter - **culture of 2 cm of catheter in the immediately subcutaneous tract + culture of 2 cm of tip of the catheter.**

Results - 30 randomized cases

Bleeding:

- **at 1 hr:** no bleeding
- **at 24 hrs:** 2 cases of major blood stain in each group, requiring dressing change
- **at day 7:** 2 cases of minor blood stain in each group

No local adverse reaction, in either group.

No episodes of dislocation

No episodes of symptomatic venous thrombosis

Results - 30 randomized cases

No infection of the exit site

No catheter-related bloodstream infection

One PICC in Group B (glue) was removed because of suspected infection, but the culture was negative.

One PICC in Group A (seal) had a tip culture positive for Candida, though blood culture was negative.

All cultures of the subcutaneous tract of the catheter were negative.

Results - 30 randomized cases

Placement of glue was simpler and faster than placement of metalic powder seal.

The compliance of nurses was very high in the glue group but quite low in the seal group

Most nurses and patients' relatives were concerned by the 'dirty' look of the exit site sealed with metalic powder seal.

Conclusion

- Both metallic powder and cyanoacrylate glue **are effective in reducing the bleeding from the exit site**, though the compliance of the health operators was higher for glue.
- Culture data suggest that sealing the exit site (with either method) may be effective in **reducing extraluminal contamination**.

A rapid look at the rest of the literature…

Much interest, few studies

2007 – **Wilkinson et al.**: Tissue adhesive as an alternative to sutures for securing central venous catheters (Anaesth)

2012 – **Pittiruti et al.**: Cyanoacrylate glue prevents early bleeding of the exit site after PICC placement (JVA)

2014 – **Lawrence et al.**: Histoacryl for securing central venous catheters: not so sticky (Anesth)

2015 – Scoppettuolo et al.: Further benefits of cyanoacrylate glue for central venous catheterisation (Anaesth)

2016 - **Rickard et al.**: A four-arm randomised controlled pilot trial of innovative solutions for jugular central venous access device securement in 221 cardiac surgical patients (J Crit Care)

Different endpoints

- Securement?
- Prevention of bleeding?
- Prevention of extraluminal contamination?

A very recent study from our group….

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ORIGINAL RESEARCH ARTICLE

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

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]

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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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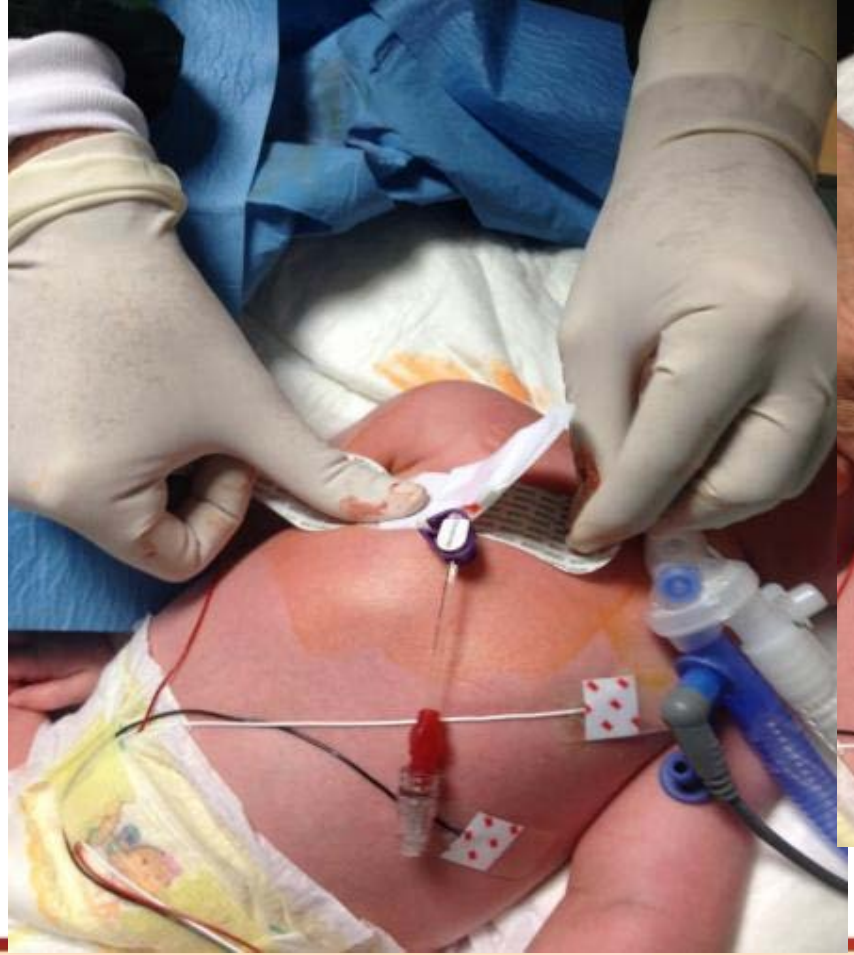

TABLE IV - Complication rates from insertion to PICU discharge

		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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Biasucci, Pittiruti et al. – JVA 2017

An insertion bundle including TUNNELLING + GLUE + SUTURELESS SECUREMENT + TRANSPARENT DRESSING (*i.e.: abolition of the risk of extraluminal contamination*) was associated with a **ten-fold reduction of the incidence of CRBSI**

Safety

- Any risk for the skin?
  - No
  - We use glue in all patients, including premature newborns

Safety

- Any risk for the catheter?
  - no

Sealing the catheter exit site: experimental study on the chemico-physical interaction of a two-component cyanoacrylate glue with peripherally inserted central catheters

Francesca Di Puccio[1], Daniela Giacomarro[1], Lorenza Mattei[1], Mauro Pittiruti[2], Giancarlo Scoppettuolo[2]

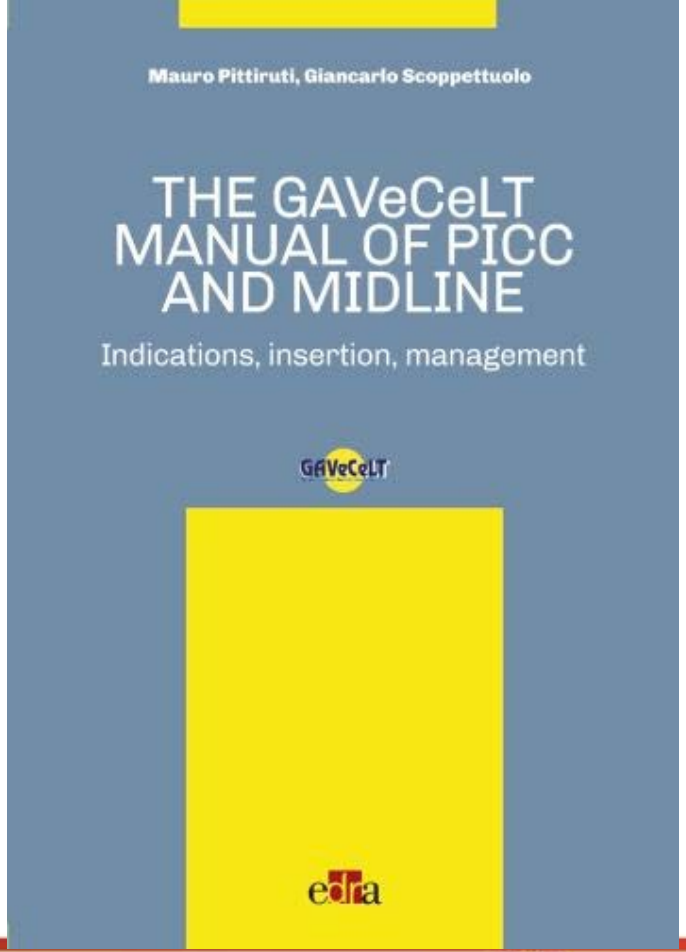
[1]Dept. Civil and Industrial Engineering, University of Pisa, Italy

[2]Fondazione Policlinico Universitario "A. Gemelli", Roma, Italy

(Journal of Vascular Access, 2017 – in press)

No damage was observed in polyurethane PICCs, not even after 12 weeks of glue apposition

Use of glue is now discussed and described also in practical handbooks on PICCs



Glue, in summary:

A simple, inexpensive, powerful tool for reducing the risk of early/late bleeding of the exit site after the insertion of PICCs, CICCs, midlines and short cannulas (with a possible benefit in terms of infection prevention).

Its role as securement is probably limited.

Its role for prevention of infection is quite promising.

Multicenter clinical study

"Effect of cyanoacrylate glue on the reduction of bleeding complications after placement of peripherally inserted central catheters (PICCs)"

Prospective, observational study

A study about SAFETY and EFFECTIVENESS

- SAFETY
- EFFECTIVENESS of glue in reducing bleeding

Endpoints

- Primary endpoints
  - Safety of glue (in terms of interactions with the skin and with the catheter)
  - Incidence of bleeding of the exit site at 24hrs and at day 7
- Secondary endpoints
  - Incidence of other catheter complications (dislodgement, infection, thrombosis, etc.)

Inclusion criteria

- All adult patients candidate to PICC insertion

Methods

- All PICCs placed according to the SIP protocol
- Cyanoacrylate glue applied on the exit site
- All PICCs secured with sutureless device and covered with transparent membranes
- Follow-up for early and late complications

The SIP Protocol

1. Hand hygiene, 2% chlohexidine and maximal barrier protection
2. Bilateral US scan of all veins at arm and neck
3. Choice of the appropriate vein at midarm (vein mm = or > cath Fr)
4. Clear identification of median nerve and brachial artery
5. Ultrasound guided venipuncture
6. US scan of IJV during introduction of the PICC
7. EKG method for assessing tip position
8. Securing the PICC with a sutureless device

Preminary results

- 180 PICCs from 5 centers

  (expected number to reach: 230 PICCs)

  - No minor or major complications related to glue
    - No catheter lesions
    - No allergy – no skin lesions
  - Local bleeding at 24hrs : 1.2%
  - Local bleeding at day 7: zero
  - Data about other complications: not yet processed