About the Presenter: Mauro Pittiruti

Professor of Surgery,
Coordinator of a Multi-professional Vascular Access Team
at the Catholic University Hospital, Rome (Italy)

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

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¹ Department of Intensive Care Medicine and Anesthesiology, “A. Gemelli” University Hospital Foundation, Catholic University of the Sacred Heart, Rome - Italy
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**TABLE I - Insertion and maintenance bundle adopted in the group of cases**

<table>
<thead>
<tr>
<th>Insertion and maintenance bundle</th>
<th>Cases</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hand washing and maximal barrier precautions</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2. Skin antisepsis with 2% chlorhexidine</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3. Ultrasound pre-puncture evaluation through RaCeVA</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>4. Ultrasound guided venipuncture</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5. Tunneling of the catheter so to obtain an exit site in the infraclavicular area</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>6. Sealing of the exit site with glue</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>7. Securement with sutureless device</td>
<td>Always</td>
<td>Inconsistently</td>
</tr>
<tr>
<td>8. Coverage with transparent semipermeable dressing</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>9. Chlorhexidine-impregnated sponges</td>
<td>After the 1st week</td>
<td>Since insertion</td>
</tr>
<tr>
<td>10. Use of neutral NFC and port protectors</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>11. Simulation-based standardized training program</td>
<td>Yes</td>
<td>No</td>
</tr>
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RaCeVA = rapid central vein assessment; NFC = needle free connectors.
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<tr>
<td><strong>Indwelling time (d)</strong></td>
<td>Total</td>
<td>648</td>
</tr>
<tr>
<td></td>
<td>Mean (±SD)</td>
<td>9.7 ± 3.1</td>
</tr>
<tr>
<td>CR-BSI</td>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>per 1000 catheter days</td>
<td>1.5</td>
</tr>
<tr>
<td>CR-DVT</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Accidental dislodgements</td>
<td>No</td>
<td>0</td>
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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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<td></td>
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<td>648</td>
<td>503</td>
</tr>
<tr>
<td>CR-BSI</td>
<td>No</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>per 1000 catheter</td>
<td></td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR-DVT</td>
<td>No</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Accidental dislodgements</td>
<td>No</td>
<td>0</td>
<td>3</td>
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CR-BSI = catheter-related bloodstream infections; CR-DVT = catheter-related deep vein thrombosis; PICU = pediatric intensive care unit; SD = standard deviation.
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

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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