Application of a Topical Hemostatic Agent to Treat ECMO Cannula Site Bleeding

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Background

- In pediatric intensive care medicine, extracorporeal membrane oxygenation (ECMO) is an extracorporeal therapeutic intervention to provide both cardiac and respiratory support for patients whose heart and lungs are unable to provide an adequate amount of gas exchange to sustain life.
- Although ECMO can be lifesaving for the critically ill pediatric or neonatal patient, mortality remains high, with abnormalities in hemostasis – bleeding or thrombosis – causing the most common severe complications.
- In patients at this academic, urban, pediatric hospital, bleeding from cannulation sites was a frequent occurrence and presented significant challenges during dressing changes.
- This bleeding can result in significant morbidity including persistent daily blood product transfusion requirements and even hemorrhagic shock.
- A retrospective review of 34 ECMO patients in 2014, excluding transthoracic and open chest cannulations, showed an incidence of bleeding in 71.1% of cannula sites but only achieving hemostasis with standard practice (Surgicel® and/or infrequent dressing changes to avoid disturbing a developing clot) in 13.7% of dressing changes.

Objective

The purpose of this project was to identify and implement a more effective topical hemostatic strategy for bleeding ECMO cannula sites.

Methods

- An in-depth literature review was performed to identify topical hemostatic strategies for ECMO cannula sites. With limited results, the search was expanded to include strategies for achieving hemostasis in vascular access catheters.
- A survey was sent to ECMO coordinators of ELSO programs to identify common strategies for achieving hemostasis at ECMO cannula sites. None of the ELSO site ECMO coordinators who responded to the survey had identified a successful method to decrease bleeding from cannulation sites.
- Based on this review, StatSeal® was selected as an alternative hemostatic agent and included in institutional cannula site dressing change guidelines.
- ECMO specialists were trained in its use and guideline compliance was tracked prospectively.
- Data on effectiveness of achieving hemostasis pre-intervention (pre) was collected retrospectively by chart review, and post-intervention (post) was collected prospectively by direct observation, audit, and chart review.

Subjects

- 46 total patients:
  - 34 pre-intervention
  - 12 post-intervention
- 51 cannula sites:
  - 38 pre-intervention
  - 13 post-intervention

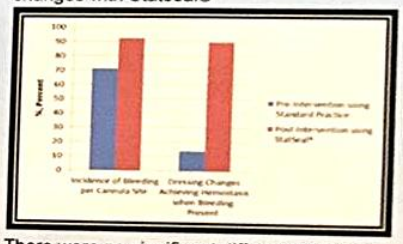
Procedure

All nurses on the ECMO team now adhere to the following protocol:

1. The ECMO specialist and the assistant put on a hat, mask, and clean gloves
2. Carefully remove the old dressing while stabilizing cannula(s), using adhesive remover if necessary
3. While assistant stabilizes cannula(s), discard dirty gloves, perform hand hygiene, and put on sterile gloves
4. Use a chlorhexidine 2% swab stick and carefully scrub cannula(s), insertion site, and surrounding skin in a back and forth motion for 30 seconds; allow to dry completely.
5. **If bleeding**:
   - Apply StatSeal® powder directly over insertion site and/or bleeding suture site
   - To contain the powder, the foam disk included in the package may be used in a circle around cannula(s) and on site
   - Place 2x2 gauze over site and hold gentle pressure on top of insertion site coated with StatSeal® powder until a "seal" has been created and there is no longer any bleeding
   - In heparinized patients, the time needed to stop bleeding with StatSeal® while holding pressure can be as long as thirty minutes
6. *If StatSeal® has been applied previously, the dried scab should be left in place when changing a dressing and cleaning the site, but any loose powder can be gently wiped away with dry sterile gauze*
7. Cover the 2x2 gauze with 4x4 gauze
8. Place silk tape securely over 4x4 gauze to adequately secure dressing to patient's skin and create occlusiveness
9. Then place silk tape over venous cannula, starting at base of dressing going upward; tab end for easy removal and repeat process for arterial cannula
10. Place an additional piece of silk tape over base of tape strips that was just placed on cannulas
11. Initial and write the time and date of dressing change on dressing

Results

- Incidence of bleeding per cannula site was 71.1% in the pre-intervention group and 92.3% in the post-intervention group
- Hemostasis was achieved in 13.7% of cannula dressing changes in the standard intervention group compared to 89.5% with dressing changes with Statseal®



- There were no significant differences in the two groups with respect to mode, cannulation site, cannulation technique, or systemic anticoagulation management.
- The trial topical hemostatic agent was ineffective at achieving hemostasis when not applied per guideline with pressure over bleeding site or for serous drainage.
- In four patients, initial hemostasis was achieved, but bleeding resumed following patient movement or cannula repositioning.
- In three of these patients, hemostasis was achieved following reapplication of StatSeal®; one awake patient received a local injection of lidocaine with epinephrine at a bleeding distal suture.

Conclusion

Statseal® is effective as a topical hemostatic agent for ECMO cannula site bleeding. Proper application, including applying pressure for the appropriate period of time, is essential to achieving hemostasis.

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