Decreasing Arterial Line Complications: lessening ischemia, pseudoaneurysms and related complications

Plastic Surgery Residencies and Plastic Surgery Fellowship Project
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Background

Radial arterial line placement and radial arterial access for procedures is not without risk to patients.

We initiated this project in 2022 to improve pre-radial arterial line screening with Allen's testing. This has resulted in system wide procedural EPIC changes. These changes are launching the week of March 13, 2023.

Numerous complications at MUSC result from placement but also removal of radial arterial lines. Pseudoaneurysms and hematomas result from lack of adequate pressure after removal.

At MUSC there are no formal system wide training for the use of TR bands with removal of A-lines.

The most common complication is hand ischemia from radial artery thrombosis in up to 18% of patients [1]

Conventional removal methods compared to patent hemostasis (with TR band devices) leads to lower rates of radial artery occlusion and ischemia, 5% vs 12% [2]

Kanei Y, Kwan T, Nakra NC. Transradial cardiac catheterization: a review of access site complica- tions. Catheter CardiovascInterv 2011;78:840–6.

Pancholy S, Coppola J, Patel T, et al. Prevention of radial artery occlusion—patent hemostasis evalua- tion trial (PROPHET study): a randomized compar- ison of traditional versus patency documented hemostasis after transradial catheterization. Cath- eter Cardiovasc Interv 2008;72(3):335–40.

Aim Statement

Improve post radial arterial line removal compliance/willingness to use TR bands by 70%

MUSC Pillar: Quality

Methods

Initiation:

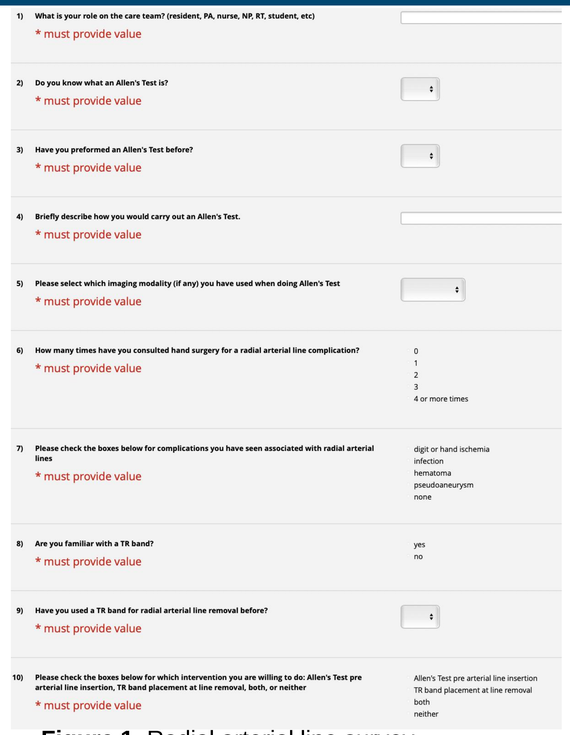
- Initial informational PowerPoint and survey were distributed to residents/fellows in 2022
- The project was re-established with new goal to inform residents/fellows of TR band use upon radial arterial line removal
- New survey was distributed via RedCAPs (Figure 1)

Halfway point:

- A secondary informational PowerPoint was distributed to residents/fellows in the PRS department
- Fliers were distributed
- Residents and fellows were made aware of imminent changes in EPIC

Reintervention:

- Survey of project awareness was sent to all departmental residents/fellows at MUSC



1) What is your role on the care team? (resident, PA, nurse, NP, RT, student, etc)
* must provide value

2) Do you know what an Allen's Test is?
* must provide value

3) Have you preformed an Allen's Test before?
* must provide value

4) Briefly describe how you would carry out an Allen's Test.
* must provide value

5) Please select which imaging modality (if any) you have used when doing Allen's Test
* must provide value

6) How many times have you consulted hand surgery for a radial arterial line complication?
* must provide value
0
1
2
3
4 or more times

7) Please check the boxes below for complications you have seen associated with radial arterial lines
* must provide value
digit or hand ischemia
infection
hematoma
pseudoaneurysm
none

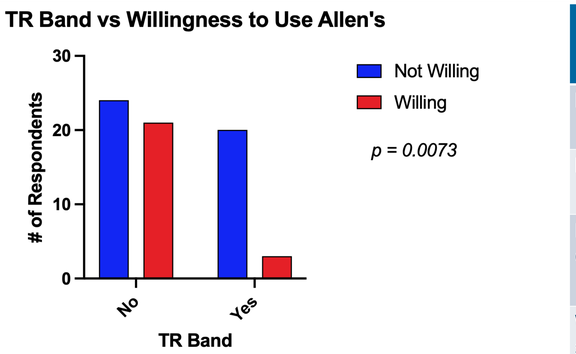
8) Are you familiar with a TR band?
* must provide value
yes
no

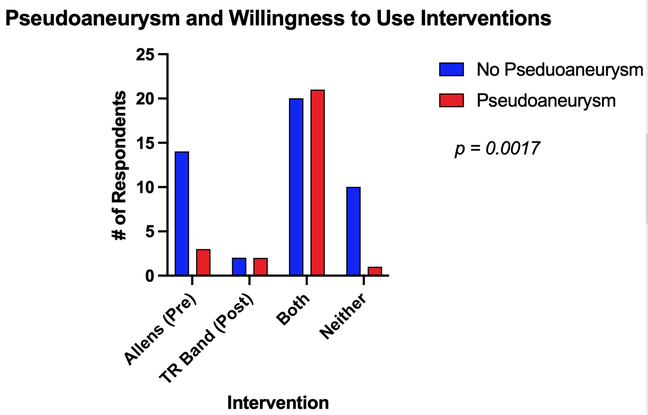
9) Have you used a TR band for radial arterial line removal before?
* must provide value

10) Please check the boxes below for which intervention you are willing to do: Allen's Test pre arterial line insertion, TR band placement at line removal, both, or neither
* must provide value
Allen's Test pre arterial line insertion
TR band placement at line removal
both
neither

Figure 1. Radial arterial line survey

Results





	ALL residents/fellows N= 68
Knowledge of Allen's Test	82.4%
Have you performed Allen's Test?	64.7%
How many times have you consulted hand?	95.3%(0) 2.4% (1) 2.4% (2)
What complications have you seen?	Ischemia (27.1%) Infection (4.7%) Hematoma (52.9%) Pseudoaneurysm (18.8%) None (30.8%)
Do you know what a TR band is/have you used one?	Yes (50.6%)/No (78.8%)
Willing to do: Allen's, TR band, both, neither	Allen's-29.4%% TR band-14.1% Both: 41.2% Neither: 27.1%

CONCLUSIONS

- There is a statistically significant difference between participants willing to do an Allen's test vs those willing to use a TR band (P=.0073)
- There is a statistically significant difference between participants who have seen pseudoaneurysm as a complication and those willing to use both Allen's and TR bands (P=.0017)
- While we did not meet our goal of willingness to use TR bands (14.1%)/both Allen's and TR band (41.2%), we did improve baseline awareness of ways to prevent radial arterial line complications.
- There needs to be a hospital wide initiative in order to implement patient safety measures for radial arterial line placement and access

Barriers

- Not all residents/fellows are involved in placing/removing radial arterial lines and this can make recognizing complications difficult.
- Dispersion of information to residents/fellows has improved with GME assistance. However, multiple disciplines place radial arterial lines (residents/fellows, APPs, RTs)
- Lack of awareness on TR band protocol/training from nursing staff

Next steps

- An Allen's test has now been added to the EPIC radial arterial line template with a "hard stop" and will be launched week of March 13th 2023.
- Increase participation in other departments (APPs, RTs) with a multidisciplinary approach across ICUs at MUSC.
- Standardize the use of adequate patent hemostasis with TR bands upon removal of a-lines across MUSC
- Retrospective chart review evaluating radial arterial line complications pre and post implementation of Allen's test in EPIC and TR band usage in the coming years
- Training/education sessions with hospital staff on using TR bands for achieving hemostasis following line removal, prior to initiating more widespread use of this device.