Significance of Micro-Puncture Use in Vascular Access with Cardiac Catheterization

Presenter: Michael Cataldo, MD

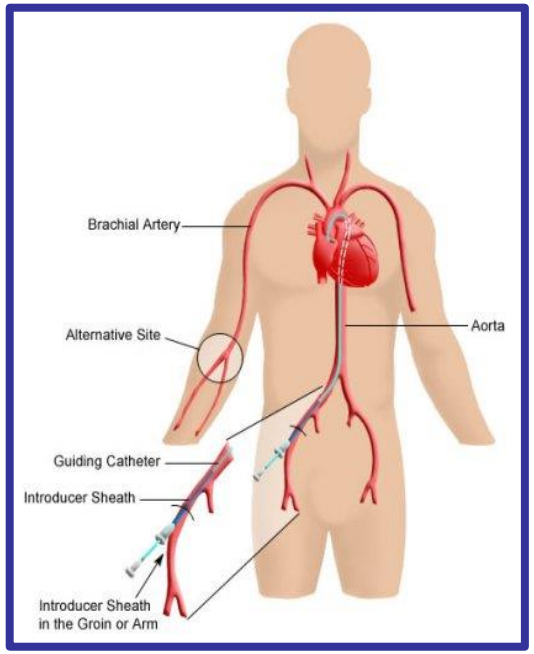
Contributors: Harika Yadav, MD; Marc Erickson, MD; Jon Austin-Ash, MD; Arpita Yadav, MD; Sravanthi Sonti, MD; Joseph Pendley, DO

Faculty Supervisor: Rehan Kahloon, MD

QIPS Day 2022

Cardiac Catheterization

- A very small, flexible, hollow tube (called a catheter) is inserted into a blood vessel in the groin, arm, or neck.
- Then it is threaded through into the heart
- Once the catheter is in place it can be used to check intracardiac pressures or inject contrast dye



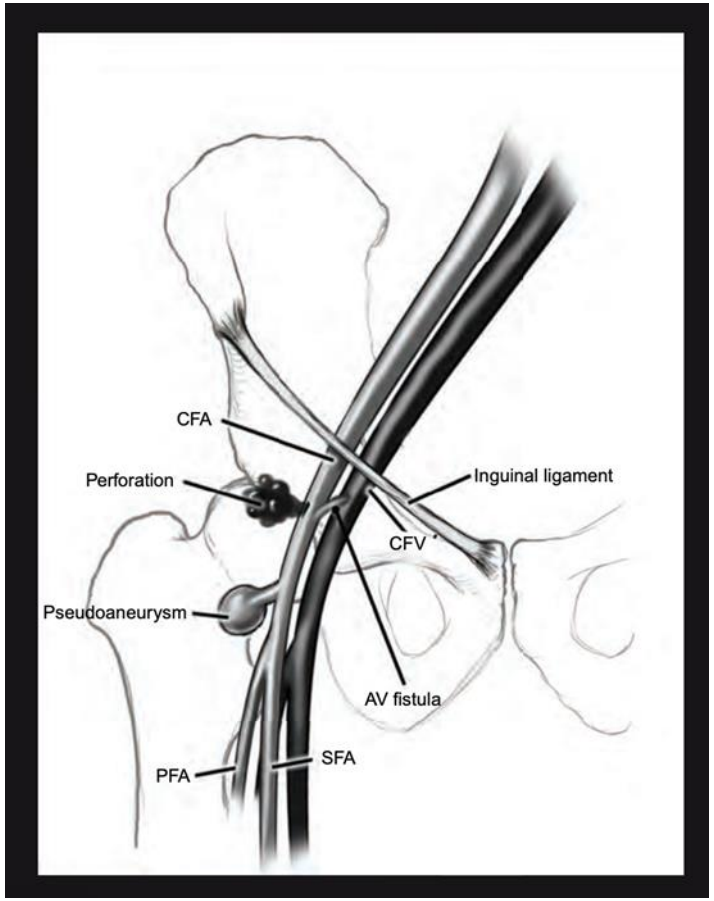
Background

Cardiac catheterization is a widely performed procedure in the U.S. (1,000,000 cases annually) with a complication rate of < 1%

<u>Common Complications</u>

- Major bleeding
- Hematoma
- Pseudoaneurysm
- AV fistula
- Retroperitoneal hemorrhage
- Arterial dissection

Erlanger is a DESIGNATED HEART ATTACK CENTER. ALL patients with an ST elevation MI should have a door to cath time of <90 min



Credit: Femoral Vascular Access Review

Micropuncture

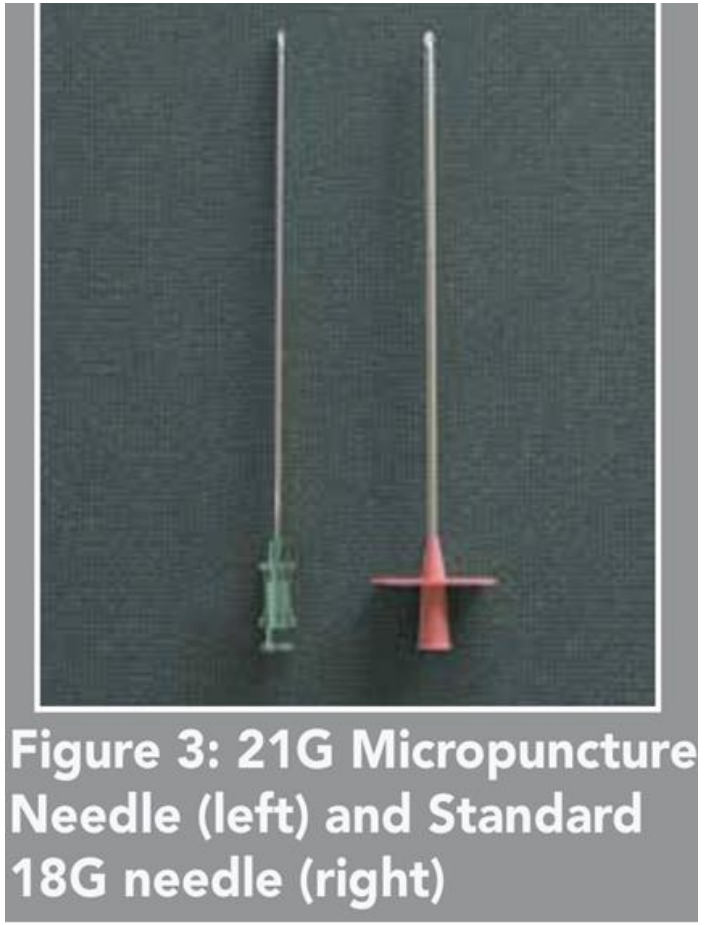


Figure 3: 21G Micropuncture Needle (left) and Standard 18G needle (right)

Credit: Cardiac Interventions Today, September 2012

- Micropuncture is done through a 21 gauge needle, 56% small than the standard 18 gauge
- However, due to varying study results, this is recommended but not required by society guidelines such as SCAI (Society for cardiovascular angiography and interventions)

Aim

ISSUE: There is currently no required technique for vascular access in cardiac catheterizations at Erlanger. Intervetionalists do not have standardized guidelines for equipment use.

RELEVANCE: Vascular complications cause further burden on patients, cause prolonged hospitalizations for treatment or monitoring and increase overall costs.

SOLUTION: We believe requiring micropuncture needles, as well as ultrasound guidance will decrease the amount of post-catheterization vascular complications. If our project proves beneficial, this can later be introduced in other departments such as critical care, vascular surgery, etc.

Expected Outcomes and Benefits

Outcomes:

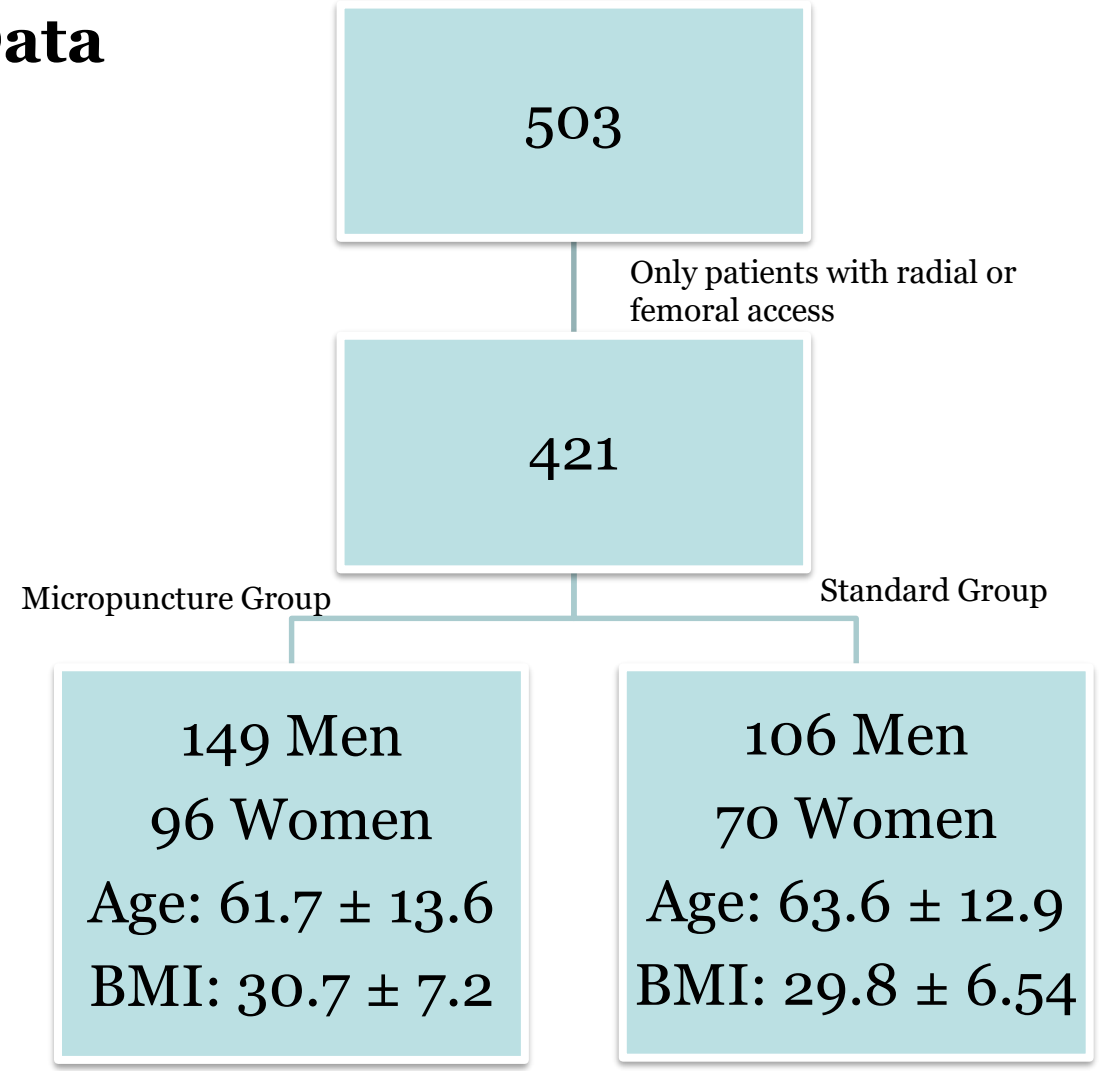
- Reduced number of vascular complications after catheterization
- Reduced over all hospital days in patients undergoing catheterization compared to previous years
- Reduced hospital costs calculated based on length of stay, imaging and additional workup needed to work up these complications.

Benefits:

- Reduced patient clinical burden from vascular complications
- Erlanger's post-catheterization vascular complication incidence reported as one of the lowest in the region
- Cut cost for hospitalizations

Data

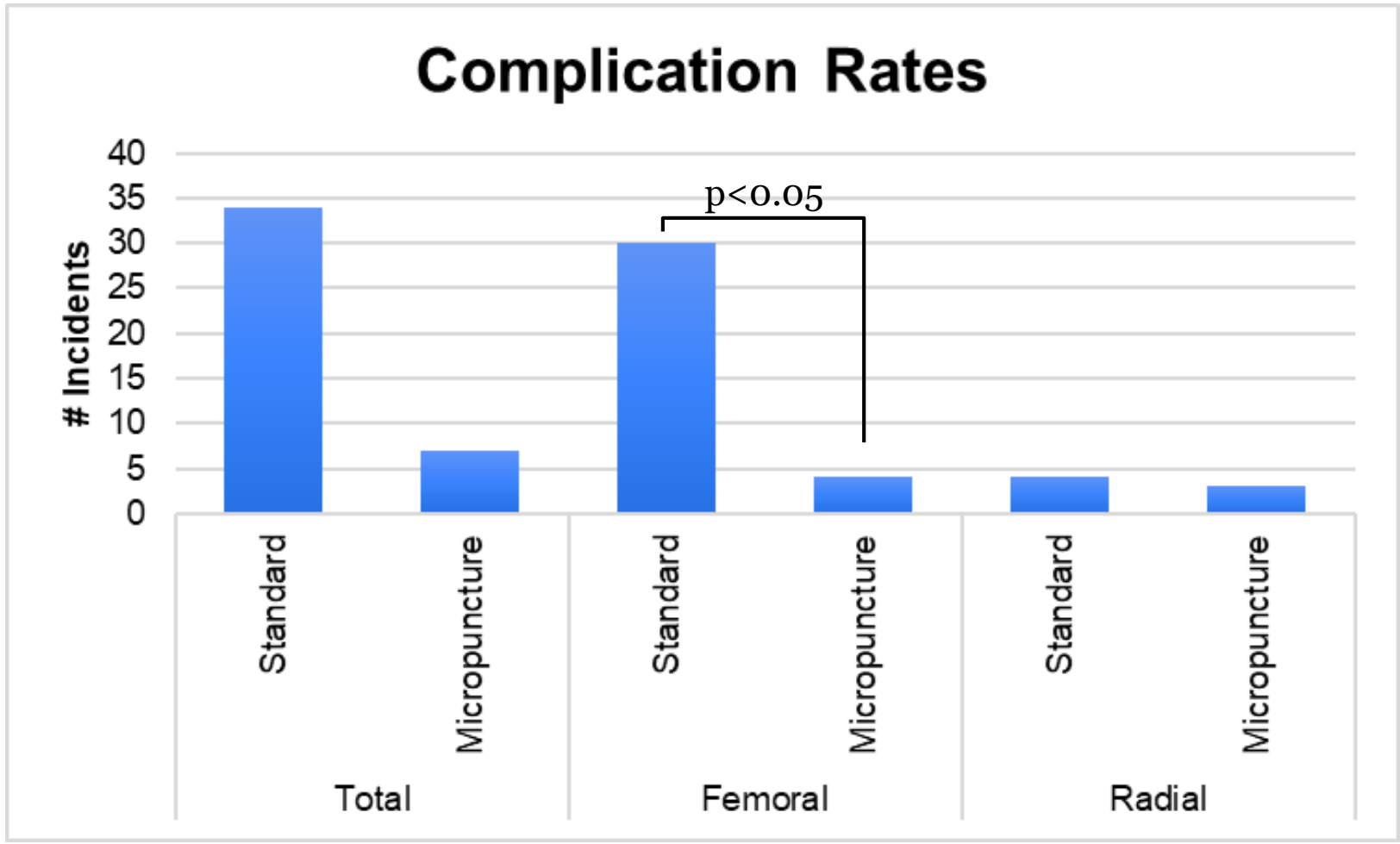
- January 2018 – January 2020
- Retrospective cohort study
- Collected through EPIC EMR
- Reason for the procedure, number of access attempts at each site, utilization of micro-puncture needle, age at time of the procedure, sex, and BMI



Complications

Complications

- Artery dissection
- Major Bleeding
- Pseudoaneurysm
- Hematoma (at puncture site)
- Retroperitoneal hematoma

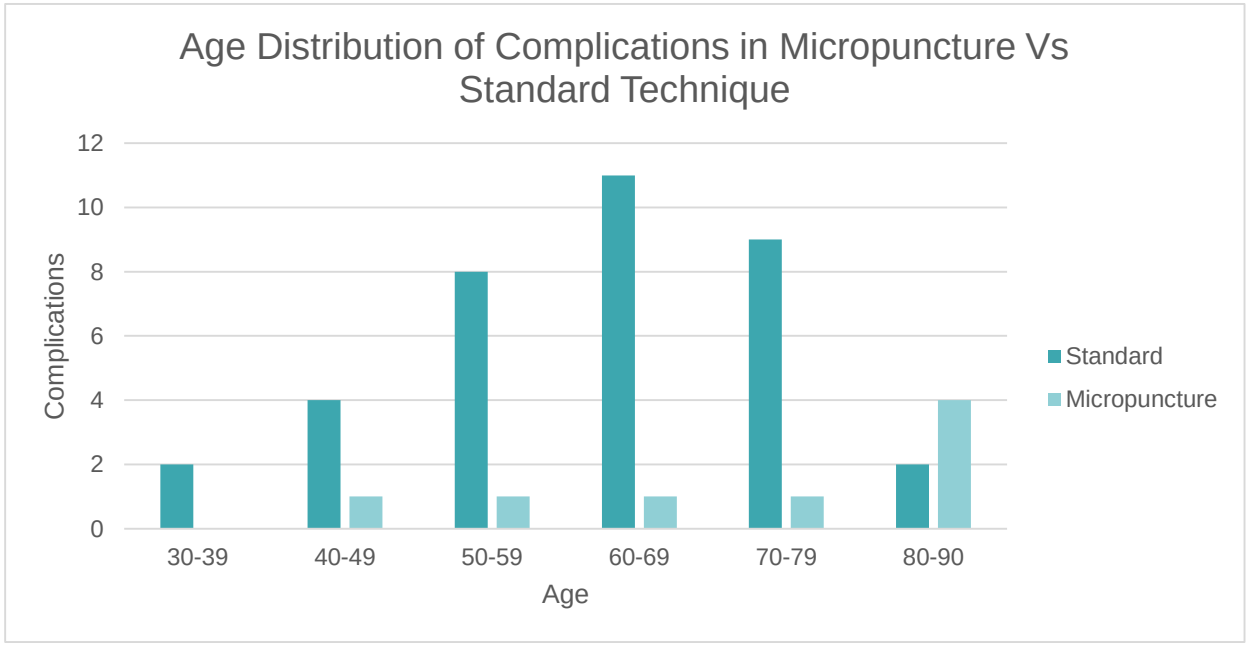


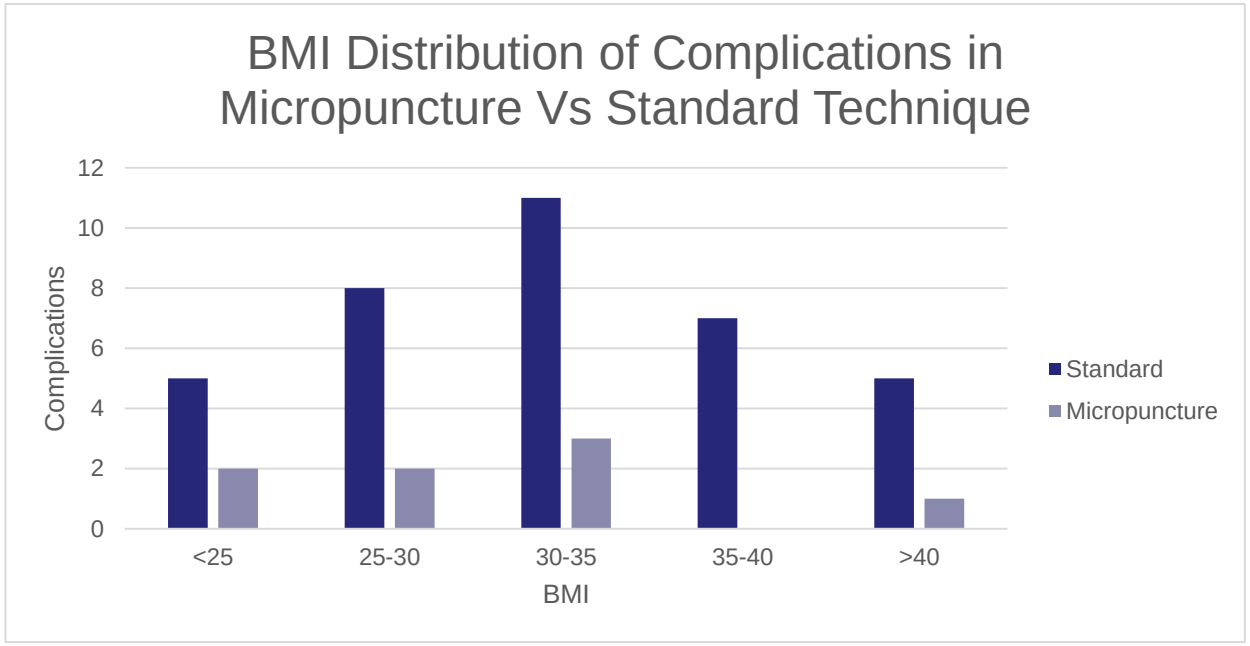
Significance

P-value > 0.05 considered statistically significant.

Variable	Odds Ratio (OR)	P-value
Femoral Access	0.17	**P < 0.05**
Age (40 – 80yo)	0.06	**P < 0.001**
BMI (> 30)	0.13	**P < 0.05**
Female	0.44	**P < 0.05**

Driving the Point Home





PDSA 1 – Obtaining objective data: Complete

ACT: educate physicians regarding benefits

Plan: Evaluate significance of micropuncture needle

Study: compare complications based on needle type

Do: obtain data and perform retrospective analysis of data

PDSA 2 - Implement protocol - Ongoing

ACT: Evaluate for reduction in complications and cost

Plan: Develop protocol for specific needle and use in specific patients

Study: monitor compliance of new protocol, barriers to compliance

Do: Continue to educate providers based on results

Current stage of project

Specific Guidelines for Access

Micropuncture for Cardiac Catheterization access - QI project

P.I.: Rehan Kahloon, MD

Per SCAI guidelines, a micropuncture needle is recommended to minimize vascular access complications. (1) We performed a study of over 500 patients in Erlanger to identify specific guidelines for our patient population.

Use of micropuncture needle is recommended in patients:

- BMI >30 (OR: 0.19 (95% C.I.); p-value: 0.015)
- Women
- Age > 40 years and <80 years
- Femoral site access (OR: 0.23 (95% C.I.); p-value: 0.058)

Reference:

1. Naidu SS, Abbott JD, Bagai J, et al. SCAI expert consensus update on best practices in the cardiac catheterization laboratory: This statement was endorsed by the American College of Cardiology (ACC), the American Heart Association (AHA), and the Heart Rhythm Society (HRS) in April 2021. Catheter Cardiovasc Interv. 2021;98(2):255-276. doi:10.1002/ccd.29744

PDSA 3 - Test efficacy of protocol

ACT: Promote standardization of micropuncture in other areas where vascular access is used such as critical care, vascular surgery, emergency department, etc.

Study: compare previous vascular complication incidence to incidence with micropuncture. Evaluate reduction in hospital days

Plan: Demonstrate superiority of micropuncture

Do: Obtain data on vascular complications over a 6 month period on new protocol. Perform a retrospective analysis

Limitations

- Small retrospective study
- Single center study with difficulty extrapolating to other institutions

Barriers

- Compliance of providers
- Education regarding our results are key
- Micropuncture needles are more difficult to visualize
- Requires extra step in cath procedure

Summary

- Micropuncture needle shows a significant reduction in cardiovascular complications. In the short term we hope to see an increase in use of micropuncture access needles, especially in high risk patient populations. This will result in reducing overall clinical burden for the patient, improvement in patient satisfaction scores, reduction in total hospital days post procedure, and net reduction in total costs including imaging, monitoring, treatment and follow up for these complications.

Thank You

Residents	Fellows	Attending
Harika Yadav, MD	Marc Erickson, MD	Rehan Kahloon, MD
Jon Austin-Ash, MD	Joseph Pendley, DO	
Sravanthi Sonti, MD		

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