



CENTRAL LINE PLACEMENT IN THE ICU

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OBJECTIVES

- 1) Review Indications and Medications Necessitating Central Line Placement
- 2) Increase Awareness of Alternative Methods to Central Line Placement Through Discussion and Case Presentation
- 3) Provide Resources and Options for Unique Circumstances When Central Line Placement May Not Be Appropriate

WHY THIS LECTURE?

- ICU Patients Need Central Access – *or do they?*
- Patient Safety and Comfort
- Staff Constraints
- Access to Care
- Medical Costs
- Medical Waste



MEDICATIONS NEEDING CENTRAL ACCESS FOR ADMINISTRATION

- Vasopressors
- Chemotherapeutic Agents
- 3% NS
- TPN
- Have a pH < 5 or > 9
 - Dobutamine (3.5)
 - Dilantin (12)
 - Tobramycin (3)
- Venous Irritants
 - Amphotericin B





WHICH BECOMES AN
EMERGENCY??

Vasopressors

CENTRAL LINE OPTIONS

- Double Lumen Central Catheter
- TLC (Triple Lumen Central Catheter)
- Cordis
- Midline
- Mediport
- PICC (Peripherally Inserted Central Catheter)
- Tunneled Central Catheter



CL CONTRAINDICATIONS AND COMPLICATIONS

- Infections
 - Central Line Associated Bloodstream Infections (CLABSI)
 - Localized Cellulitis
- Bleeding
 - Excessive Blood Loss
 - Coaguopathic
 - Iatrogenically Elevated INR
 - Liver Failure
 - Blood Clotting Disorder
- Pneumothorax/Hemothorax
- VTE (Venous Thromboembolism)
- Compartment Syndrome (IO)



EMERGENT TLC ALTERNATIVES

- Central
 - Mediport
 - IO (Intra Osseous)
 - Mid Line
 - PICC (Peripherally Inserted Central Catheter)
- Peripheral
 - PIV (Peripheral Intravenous)
 - SQ Button (Subcutaneous)
 - SL (Sub-Lingual)



CONTRAINDICATIONS TO ALTERNATIVES

Biggest Complications:

Can't place!!!

Extravasation



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VASOPRESSORS

- Norepinephrine (Levophed)
- Dopamine (Inotropin)
- Vasopressin (Pitressin)
- Phenylephrine (Neo-Synephrine)
- Epinephrine (Adrenaline)
- Dobutamine (Dobutrex)



NOREPINEPHRINE (LEVOPHED)

- Alpha-1 Adrenergic
- 2-100 mcg/min (0.5-3 mcg/kg/min)
- Pressor of Choice in MOST Shock
 - Septic
 - Cardiogenic
 - Hypovolemic
- Injury With Extravasation Injuries > 33 mcg/min
- 10 mcg/min Through a PIV



DOPAMINE (INOTROPIN)

- Alpha-1 Adrenergic
- 2-20 mcg/kg/min
- Second-line Agent to Norepinephrine
 - Adverse Effects: Tachyarrhythmias
- **JUST** as Dangerous as Norepinephrine!!!
- “Renal Protective” Doses – *Out the Window*
 - 2-5 mcg/kg/min *With PIV*



VASOPRESSIN (PITRESSIN)

- Antidiuretic Hormone
- 0.04 Units/Minute (Not Titrated)
- Augments Other Pressors
- Pure Vasoconstrictor
 - MAY Decrease Stroke Volume and Cardiac Output
- Recent Studies Not Supportive



PHENYLEPHRINE (NEO-SYNEPHRINE)

- PURE Alpha-Adrenergic Vasoconstrictor
- 20-200 mcg/minute (0.25 -2.4 mcg/kg/min)
- Initial Vasopressor for Tachyarrhythmias
- No Known Extravasation Issues
 - Arguably Safest of All Pressors Peripherally
- Through a PIV 10-20 mcg/min



EPINEPHRINE (ADRENALIN)

- Alpha-1 Adrenergic
- 1-35 mcg/min (0.014-0.5 mcg/kg/min)
- Initial Pressor for Anaphylactic Shock
- Usually Secondary Added Agent
- Adverse Effects
 - Increases Heart Rate –Tachyarrhythmias
 - Elevated Lactate
 - Decreased Mesenteric Perfusion



DOBUTAMINE (DOBUTREX)

- Beta-1 Adrenergic
- 0.5-20 mcg/kg/min
- Agent of Choice in Cardiogenic Shock IF:
 Low Cardiac Output (WITH Maintained BP)
- Adverse Effects:
 - Hypotension
 - Tachyarrhythmias



STAGES OF EXTRAVASATION INJURY

Stage 1: Painful Site, No Erythema or Swelling, Flushes with Difficulty

Stage 2: Painful Site, Slight Swelling & Erythema, No Blanching, Brisk Cap Refill Below Site

Stage 3: Painful Site, Marked Swelling & Blanching, Cool to Touch, Brisk Cap Refill Below Site

Stage 4: Painful Site, Very Marked Swelling & Blanching, Cool to Touch, Capillary Refill > 4 Seconds, Decreased or Absent Pulse, Skin Breakdown or Necrosis

EXTRAVASATION TREATMENT

- 1) CHANGE Sites
 - Switch to another IV
 - Place IO or central line
- 2) DO NOT Remove Cannula
- 3) EXTRACT/ASPIRATE as Much SQ Fluid as Possible
- 4) TREAT with Phentolamine (*See Next Slide*)
- 5) CONSULT Plastics



PHENTOLAMINE ADMINISTRATION

- Vials of 5 mg/1 ml
 - Place in 9 ml of NS
- Dose: 0.1 to 0.2 mg/kg (Max 10 mg)
 - Use 25 G Needle (or Smaller)
- Inject Through Catheter
 - SQ Around the Site



PHENTOLAMINE ADMINISTRATION

- Administered ASAP
 - Even if Area Looks a Little White or OK
- Effects Should be Immediate
 - May Need to Consider Additional Dose
- Now Pull the Catheter



HOW PENTOLAMINE WORKS

- Alpha1-Blocker
 - Diminished Vasoconstricting Effect
- Adverse Effects
 - Systemic Hypotension
 - Cerebrovascular Spasm
 - Tachycardia/Cardiac Arrhythmias



HYALURONIDASE FLUSHING

- Create Dilute Hyaluronidase
 - Ratio: 150 units/ml of Saline
 - Dose is 1ml (Max 2 ml)
 - Use 25 G Needle (or Smaller)
- Numb Area with Lidocaine (***Without Epi***)
- Inject 5 Separate Areas Around Edges of Extravasation
 - Inject Through Original Cannula (*if Not Yet Removed*)



HYALURONIDASE FLUSHING

- Make 4 Stab Wounds Around Each Point
- Insert a Cannula
 - Blunt Ended With Side Holes (Liopsuction Cannula)
- Flush 500 ml of NS Through the Wound
- How it Works:
 - Reversibly Hydrolyses Mucopolysaccharides of SQ Tissues
 - Enhances the Permeability of Tissue Compartment
 - Increased Irrigation



EXTRAVASATION PREVENTION GUIDELINES

- Avoid the Hand and Wrist
 - Caution in the AC Fossa
- Avoid Poor Quality/Questionable IVs
- Consider Avoiding US Guided Lines
- Perform an Extremity Check Per Protocol EACH TIME
- Have Antidotes Readily Available
- Phentolamine Additives
 - 10 mg/Liter of Solution
 - Does NOT Dilute Pressor Effect



CASE PRESENTATION #1

- 53 yo Female With Scleroderma on Chemotherapeutic Agent Cytosan. Presents with R) LL Pneumonia, Sepsis and Intractable N/V.
 - BP is 82/44, HR 118
 - Mentation Diminished, but Answering Questions
 - Unable to Maintain PIV (Had Two)
- On Vanco, Zosyn
- Blood Glucose 473



CASE #1 DISCUSSION

- Does This Patient Need a Central Line?
 - What Would You Try First?
 - What is She Going to Need?
 - What if BP Responds to a 500 cc Fluid Bolus x 1
 - How Long Has She Had Nausea and Vomiting?



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 - What Would You Try First?
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 - What if BP Responds to a 500 cc Fluid Bolus x 1
 - How Long Has She Had Nausea and Vomiting?
- Would This be Changed if Blood Glucose was 47?



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- Does This Patient Need a Central Line?
 - What Would You Try First?
 - What is She Going to Need?
 - What if BP Responds to a 500 cc Fluid Bolus x 1
 - How Long Has She Had Nausea and Vomiting?
- Would This be Changed if Blood Glucose was 47?
- How Does She Receive Her Cytosan?



CASE PRESENTATION #2

- 32 yo Male with ESLD Secondary to ETOH. On Midodrine 5 mg TID with a BP of 88/34 – MAP of 52
 - Mentation is Decreased, but Appropriate and Stable
 - Cr is 4.2
 - MELD Score is 36
 - Last ETOH was 5 Months Ago



CASE PRESENTATION #2

- 32 yo Male with ESLD Secondary to ETOH. On Midodrine 5 mg TID with a BP of 88/34 – MAP of 52
 - Mentation is Decreased, but Appropriate and Stable
 - Cr is 4.2
 - MELD Score is 36
 - Last ETOH was 5 Months Ago
- PICC Line Placement Planned for the AM
- Has One 22G Peripheral after Losing Other 18 G PIV about 30 minutes ago



CASE #2 DISCUSSION

- Does This Patient Need a Central Line?
 - What is the Appropriate MAP for a Patient with ESLD?
 - If You Determine They Don't Need a TLC, Why Place a PICC?
- What Are Your Limiting Factors?
 - Age
 - Mentation
 - Check/Treat Ammonia Level



CASE #2 DISCUSSION

- Does This Patient Need a Central Line?
 - What is the Appropriate MAP for a Patient with ESLD?
 - If You Determine They Don't Need a TLC, Why Place a PICC?
- What Are Your Limiting Factors?
 - Age
 - Mentation
 - Check/Treat Ammonia Level
- What Other Options Do You Have?
 - Optimize Midodrine
 - Bridge to Potential Liver Transplant



CASE PRESENTATION #3

- An 87 yo Female with End-Stage Congestive Heart Failure, Hypotension, Hypoxia and + 3 Anasarca
 - Current BP 68/36, HR 94, SpO2 91% on 6 L NC
 - Present Access – 22 G PIV
 - Code Status: Full



CASE PRESENTATION #3

- An 87 yo Female with End-Stage Congestive Heart Failure, Hypotension, Hypoxia and + 3 Anasarca
 - Current BP 68/36, HR 94, SpO2 91% on 6 L NC
 - Present Access – 22 G PIV
 - Code Status: Full
 - Albumin Bolus Fails to Increase BP
 - Patient is Refusing ABG, Central Line Placement
 - Waxing and Waning Mental Status



CASE #3 DISCUSSION

- Does This Patient Need a Central Line?
 - How Does This Change if PIV is Lost?
 - What if a PICC Could be Placed in 4 Hours?
 - What if Patient is Changed to a DNR?
 - What if You Can't Get Ahold of the Family?
- What Are Your Limiting Factors?
 - Severity of Illness
 - Age
 - Patient Comfort – *Communicate*



CASE PRESENTATION #4

- 93 yo Male with Hyponatremia (Na 114)
 - VSS
 - Abnormal Mentation
 - Current Access: Two 20 G PIVs
- History of Seizures
- Unknown if Acute or Chronic
- No History of ETOH



CASE #4 DISCUSSION

- Does This Patient Need a Central Line?
 - What if Patient is DNR?
 - What if BP is 103/34 – MAP 57



CASE #4 DISCUSSION

- Does This Patient Need a Central Line?
 - What if Patient is DNR?
 - What if BP is 103/34 – MAP 57
- What Are Your Treatment Options?
 - 2% Saline Through a PIV
 - Treat to SBP > 90; NOT MAP



UNIQUE MEDICAL CONSIDERATIONS

#1 – Don't Fail to Utilize a Mediport, IO, PICC or Midline *if Available*

#2 – ESKD MAPs MAY Be Appropriate at 50-55

Mentation is Key

#3 – Don't Fail to Recognize Someone at End of Life

Communicate Effectively with the Patient and Family

#4 – Hyponatremia Can Be Treated with **2% Saline** Through a PIV

If 3% Saline is Required – Central Access is Required

#5 – MAPs in Elderly May Be **Misleading**

Titrate Pressors/Determine Treatment Based on SBP > 90 + *Mentation*



SUMMARY POINTS

- Despite Common Belief, Central Line Placement is **NOT** Always Necessary
- Pressors **CAN** Be Given Through a Peripheral Line
 - Maximum Doses
 - Various Drugs
- Numerous Options Exist For Vascular Access
- **LOOK** at Your Patient – Not Just Their Numbers
 - Know the Alternatives



FUTURE AREAS OF RESEARCH

- Easier/Safer Venous Access Options
- Maximum Peripheral Medication Doses
- Alternative Pressor Mechanisms of Action
- Additional Extravasation Treatment Options



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Thank You!



QUESTIONS?