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
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
CL CONTRAINDICATIONS AND COMPLICATIONS

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  - Localized Cellulitis

- Bleeding
  - Excessive Blood Loss
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CONTRAINDICATIONS TO ALTERNATIVES

Biggest Complications:

Can’t place!!!

Extravasation
• Norepinephrine (Levophed)
• Dopamine (Inotropin)
• Vasopressin (Pitressin)
• Phenylephrine (Neo-Synephrine)
• Epinephrine (Adrenaline)
• Dobutamine (Dobutrex)
NO REPINEPHRINE (LEVO PHED)

- 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-1Adrenergic

• 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
VASO PRESSIN (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 Vasconstrictor
• 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
HYALURO NIDASE 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)
HYALURO NIDASE 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 Cytoxan. 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?
• 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?
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?

• Would Thisbe Changed if Blood Glucose was 47?

• How Does She Receive Her Cytoxan?
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?
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• What Are Your Limiting Factors?
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  • 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 – ESLD 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?