Comparison of aPTT values from venipuncture and central venous access device specimens in hospitalized adult patients receiving continuous heparin infusions

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Introduction

CONTINUOUS HEPARIN INFUSIONS require monitoring aPTT values. Blood samples can be collected from a central venous access device (CVAD) if present or from a peripheral vein (PV). If heparin is infusing through a CVAD, how should aPTTs be collected?

• Peripheral specimen required/desired?
• From CVAD acceptable? Desired port?
• Turn off infusion? How long? Flush first? Waste amount?

Purpose

Is there a clinically significant difference between the aPTT results from a CVAD specimen and a peripheral venipuncture (VP) when the patient is receiving continuous heparin through the CVAD?

Relevant Literature

Venipuncture vs Heparinized Arterial Line

• Alzateani (2004) (n=49) Arterial aPTT unreliable
• Heep (1997) (n=79) Arterial aPTT valid 96% of time

Venipuncture vs Heparinized CVAD without continuous heparin infusion

• Humphries and Baldwin (2012) (n=30) Power = .71
• .99 correlation between PICC and VP specimens
• Rondina (2007) (n=41)
• No significant difference between CVAD and VP specimen
• Hinds (2002) (n=53 pediatric patients with tunneled CVAD) Tunnneled CVAD results inaccurate but as discard volume increased paired results closer (tested 6,9,12mL discards)

Venipuncture vs CVAD with continuous heparin infusion

• Bellmum, P. et al. (2009) (n=74)
• Significant difference in aPTT between CVAD and venipuncture specimens with either a 10 or 20mL discard – the difference was slightly lower with 20mL, discard (10.6 sec aPTT difference with 20mL discard vs 12.7 sec with 10mL discard)

Discrepancies at Start of Study

Policies

Lab: Turn off infusion • Waste depends on dead space – 5-12mL
Nursing: No mention of stopping infusion first • No mention of “desired port” • Waste first 6 mL


• Stop infusion •Flush with 3.5 mL saline •Distal lumen preferred •Discard volume = 1.5-2 times the fill volume of the CVAD

Manufacturer’s Guidelines

• Use proximal port
• Turn off distal infusions for at least one minute
• Discard volume varies from priming volume (dead space) to 3-10mL

• Flash per hospital protocol
• Waste 2-6X the priming volume
• 5mL/6x the priming volume of all non-tunneled PICC

Actual RN practice at Good Samaritan Hospital

• 134 respondents completed an online survey in 2009
• 82% flushed prior to obtaining sample
• 50% wasted 10 mL
• 56% collected the coagulation specimen first
• 94% stopped the infusion

Study Design & Methods

• Paired blood specimens (CVAD & peripheral venipuncture) from 74 patients receiving a continuous heparin infusion through a CVAD. Specimens were collected simultaneously by a research RN and a phlebotomist
• Protocol: turn off infusions for at least 1 minutes, flush line with 10 mL, wait 1 minute, draw and discard 10mL, then draw aPTT specimen.
• Power = .80 with alpha=.05

Sample Characteristics

• Age: mean = 67.5 yrs (SD 13.8), median = 70, range 26 to 94
• Sex: 36 females (49%), 38 males (51%)
• Race: 63 white (85%), 11 other (15%)

Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>mean (SD)</th>
<th>t-test statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTT difference (seconds)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From central line</td>
<td>55</td>
<td>82.1 (47.2)</td>
<td>t372 = -1.642</td>
<td>.105</td>
</tr>
<tr>
<td>From venipuncture</td>
<td>54</td>
<td>84.0 (62.2)</td>
<td>t372 = -1.642</td>
<td>.105</td>
</tr>
<tr>
<td>PTT difference (seconds)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CVAD – venipuncture)</td>
<td>74</td>
<td>8.1 (4.6)</td>
<td>t73 = -2.017</td>
<td>.047</td>
</tr>
</tbody>
</table>

PTT difference by relative position of sampling port

Discussion

• PTT values between CVAD & peripheral specimens were significantly different if sample was drawn from heparin infusion port; there was no difference between peripheral & CVAD specimens if sample was drawn from port either proximal or distal to heparin infusion port.
• For nurses, compatibility of infusates was of greater concern than which port of the CVAD was used for the infusion, resulting in no standard approach to “which drug should be infused where.”
• After study began, the INS (2011) issued standards recommending coagulation studies not be drawn from lines with any exposure to heparin.
• Institution policies were recently revised to recommend peripheral specimens for coagulation studies.

Recommendations

• Collect aPTT specimen from peripheral venipuncture if possible
• IF CVAD specimen necessary:
  • Collect from port without a heparin infusion
  • Follow INS guidelines-turn heparin off 5 minutes prior to specimen collection
• Designate port for heparin infusion—proximal port is preferred as blood flow diffuses drug into circulation.

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