Hepatic extravasations associated with umbilical venous catheter in neonates: A prospective observational study

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POSITION OF THE CATHETER
COMPLICATIONS OF MALPOSITIONED CATHETER

- Pleural Effusion
- Portal Vein Thrombosis
- Chylothorax
- Hepatic Extravasations
- Ascites
Review of literature

- Retrospective study by Hsin-Jen Chen et al. (2019, Taiwan): 78.8% showed UVC malpositioning at first radiograph. HE involved mainly left lobe.


- Hepatic vessel perforation causing ascites and right hepatic collection was described by Pegu et al. (2018).

3 Pegu S, Murthy P. Ascites with hepatic extravasation of total parenteral nutrition (TPN) secondary to umbilical venous catheter (UVC) malposition in an extremely preterm baby. Case Rep [Internet]. 2018 Oct 8
Aims and objectives

To study the incidence and profile of hepatic extravasation (HE) injury associated with Umbilical Vein Catheterisation (UVC)

UVC- umbilical venous catheter
HE- hepatic extravasation
- **Study design:** prospective observational study
- **Study setting:** NICU of a tertiary care hospital
- **Study period:** March 2018 to September 2019
- **Study population:** all neonates admitted in NICU and requiring UVC
- **Sample size:** purposively included all neonates with UVC
- All babies who required umbilical vein cannulation were enrolled

1. All newborns requiring TPN,
2. Newborn with hypoglycaemia requiring GIR % of dextrose >12.5%
3. Term babies with asphyxia requiring therapeutic hypothermia
4. Hemodynamic instability
5. Hyperbilirubinemia in exchange range and
6. Those with difficult peripheral line access depending on clinical condition

- Length of insertion is determined using **Shukla’s formula** - [umbilical artery (UA) catheter length = body weight (BW) x3 + 9; UV catheter length = 1/2 UA line+1; lengths were measured in centimeters and BW was measured in kg]
- Position of the catheter was confirmed by X-RAY soon after line placement and USG abdomen within 24 to 48 hours
**On X-RAY**: Proper position was considered when UVC tip was in T9 to T10

**In USG**: UVC tip should be placed inside IVC

**MALPOSITION**

USG repeated after 48 hours

Repeat X rays done for other clinical indications where screened for UVC mal position later purposes

**FLUID INFUSION - TYPE AND OSMOLALITY WAS NOTED**

Investigations were done for all babies as clinically indicated.
PARAMETERS NOTED

1. Birth weight
2. Gestational age
3. Time when hepatic extravasation was detected
4. Symptoms and signs of hepatic extravasation
5. Osmolarity of fluid transfused
6. Laboratory parameters like liver function tests and Haemoglobin
7. Final Outcome
OUTCOME MEASURES

1. Relative Risk of developing hepatic extravasation due to UVC placements

2. Clinical features of hepatic extravasation
Total no of neonates with UVC no (274)

Proper positioned 227(83%)
- Proper position 209 (76.2%)
  - Hepatic extra vasation-1
  - No hepatic extravasation -208

Mal positioned 47(17%)
- Migration in repeat X-rays and USG – 18 (6%)
  - Mal-positions 65(23.7%)
  - Hepatic extra vasation-10
  - No hepatic extravasation -55
Results

- Median Gestational age: 27.2 weeks
- Median birth weight: 1020 g
- Total number of neonates requiring UVC: 274
- Mal-position: \textbf{65 (23.7\%)}
- Hepatic extravasation in malposition UVC \textbf{10 (15.4\%)}, accounting to \textbf{3.6\%} of UVC insertions
<table>
<thead>
<tr>
<th>Day of hepatic extravasation</th>
<th>no of patients</th>
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<tbody>
<tr>
<td>Day 2</td>
<td>5</td>
</tr>
<tr>
<td>Day 5</td>
<td>1</td>
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<tr>
<td>Day 6</td>
<td>1</td>
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<td>Day 7</td>
<td>1</td>
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<td>Day 8</td>
<td>1</td>
</tr>
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<td>Day 11</td>
<td>1</td>
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## Relative Risk of developing hepatic extravasation

<table>
<thead>
<tr>
<th></th>
<th>Hepatic extravasation (+)</th>
<th>Hepatic extravasation (-)</th>
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<tbody>
<tr>
<td>Mal-position (+)</td>
<td>10</td>
<td>55</td>
</tr>
<tr>
<td>Mal-position (-)</td>
<td>1</td>
<td>208</td>
</tr>
</tbody>
</table>

Relative risk for mal-positioned UVC to develop HE= 32.15(CI: 4.1-246.4), P=0.0008
Clinical features at presentation

- Shock: 18.1%
- Abdominal distension: 36.4%
- Ascites: 27.3%
- Hepatomegaly: 36.4%
- Asymptomatic: 63.6%
Proportion of cases with comorbid conditions

- PDA: 45.5% (5)
- RDS: 90.9% (10)
- IVH: 45.5% (4)
- Sepsis: 90.9% (10)
LABORATORY PARAMETERS

- Of the 11 neonate with hepatic extravasation, 1 had derangement in hepatic enzymes.

- Average fall in hemoglobin after extravasation 2.33 mg/dl, it was statistically significant.
Fluid osmolarity

- All neonates with mal-positioned UVC and hepatic extravasation were given fluid of high osmolarity (median 1019 mosmol/lit) through the umbilical venous catheter
- Median time of detection of HE- 4 days (range 1-16)
- Median time of mal-positioned UVC with extravasation indwelling- 4 days
- Median time of UVC mal-positioned without HE- 5 days

- Out of the 11 cases with hepatic extravasation 3 neonates died. Death was not related to extravasation.
## DISCUSSION

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<tbody>
<tr>
<td>Study period</td>
<td>1.5 years</td>
<td>5 years</td>
<td>5 years</td>
</tr>
<tr>
<td>No: of cases with HE</td>
<td>11</td>
<td>33</td>
<td>9</td>
</tr>
<tr>
<td>Proportion of UVC insertions that developed HE</td>
<td>3.6%</td>
<td>2.26%</td>
<td>0.8%</td>
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<tr>
<td>Average birth weight</td>
<td>1020 g</td>
<td>1443.3g (SD 807.7 g)</td>
<td></td>
</tr>
<tr>
<td>Average gestational age</td>
<td>27.2 weeks</td>
<td>30.5 weeks (SD 4.7 weeks)</td>
<td>36.9 (SD 5.5 weeks)</td>
</tr>
<tr>
<td>Duration of UVC indwelling</td>
<td>4 days</td>
<td>5.5 (SD 2.1 days)</td>
<td>-</td>
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<tr>
<td>Time of detection of HE</td>
<td>4 days</td>
<td>Most within 2-4 days</td>
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<tr>
<td>Liver function test</td>
<td>9%</td>
<td>Abnormal in 6%</td>
<td>-</td>
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<tr>
<td>Commonest Clinical presentation</td>
<td>Asymptomatic</td>
<td>-</td>
<td>Abdominal distension hepatomegaly</td>
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CONCLUSIONS

- X ray and USG can help to assess correct position of UVC

- The rate of HE was significantly high in mal-positioned UV catheterization

- Avoiding mal-position can prevent HE incidence to a great extend (Relative risk for mal-positioned UVC to develop HE = 32.15 (CI: 4.1 - 246.4))

- Most cases of HE were asymptomatic
PITFALLS

- Smaller sample size
- Number of attempts have not been documented
FUTURE RECOMMENDATIONS

- Conduction of study with a larger size stratified sample
- Should Mal-positioned UVC be treated as a peripheral line??
References
