Intraoperative Insulin Administration and Hypoglycemia in Diabetic Patients

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INTRODUCTION

- Although studies are conflicting as to the benefit of intensive insulin therapy (IIT) in the critically ill, there is a 6x increase in hypoglycemia incidence in patients treated with IIT
- Anesthesia masks signs and symptoms of hypoglycemia, making intraop hypoglycemia difficult to detect clinically
- We performed this retrospective, observational analysis to:
  - Determine the incidence of intraoperative hypoglycemia and severe hypoglycemia
  - Evaluate possible causes of hypoglycemia
  - Determine intraop monitoring and treatment practices of diabetic patients at a large academic hospital

METHODS

- After IRB approval, diabetic patients who had surgery from 2005-2010 were retrospectively analyzed (Table 1)
  - preoperative insulin status
  - intraoperative blood glucose (BG) values
  - insulin boluses and infusions given
  - dextrose (D50) doses given
- Data obtained from our Anesthesia Information Management System and point-of-care glucose (Accu-Chek) databases
- Manual chart examination and root cause analysis for patients with BG <40
- Patients receiving insulin and D50 for hyperkalemia were excluded
- Insulin treatment as a function of highest intraop glucose was determined (Fig 1)
- Representative examples of 2 patients who experienced severe intraop hypoglycemia are presented graphically (Figs 2 and 3)

RESULTs

Table 1. Hypoglycemia incidence

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>% of Diabetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total surgical patient-cases</td>
<td>80,379</td>
<td>-</td>
</tr>
<tr>
<td>Diabetics</td>
<td>10,966</td>
<td>-</td>
</tr>
<tr>
<td>Taking insulin pre-op</td>
<td>4,301</td>
<td>39.2</td>
</tr>
<tr>
<td>Taking only oral agents pre-op</td>
<td>6,665</td>
<td>60.8</td>
</tr>
<tr>
<td>Received intra-op insulin</td>
<td>3,890</td>
<td>35.5</td>
</tr>
<tr>
<td>Received intra-op D50 for hypoglycemia</td>
<td>61</td>
<td>0.56</td>
</tr>
<tr>
<td>Hypoglycemia (BG 41-60)</td>
<td>88</td>
<td>0.80</td>
</tr>
<tr>
<td>Severe hypoglycemia (BG ≤40)</td>
<td>27</td>
<td>0.25</td>
</tr>
</tbody>
</table>

DISCUSSION

- Despite conservative glycemic practices, clinically relevant intraoperative hypoglycemia still occurred in 115 (1.05%) of diabetic patients (95% CI 0.87 – 1.26 % by Clopper-Pearson)
- Hypoglycemia incidence similar to that in conventional tx group in ICU studies
- Frequent monitoring of BG during administration of IV insulin is mandatory
- Differences in treatment thresholds between patients on and not on pre-op insulin may reflect a reticence to institute a new treatment modality in insulin-naïve patients
- Explanations for severe hypoglycemic events include taking insulin while NPO, excessive insulin administration, and not checking hourly BG while on an insulin infusion
- Most episodes of severe hypoglycemia were likely preventable

REFERENCES