Managing Hyperglycaemia in patients with diabetes on enteral nutrition: the role of a diabetes team

A/Professor Vincent Wong
Dr Mani Manoharan
Ms May Mak
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Enteral and Parenteral nutrition

- Nutrition guidelines stated that patients who cannot consume adequate nutrients orally (60% of nutrition requirement) for at least 5 days in the critically ill should be a candidate for specialized nutrition. ¹

- Improving the nutritional state of patients may restore immunological competence and reduce the frequency and severity of infectious complication in hospitalized patients support.

- Enteral feeds with low carbohydrate high mono-unsaturated fatty acid formulas) are preferable to standard high carbohydrate formulas in patients with diabetes. ²

² Kreyman et al, Clin Nutr 2006; 25: 210
Why is this a problem?

- Managing in-patient hyperglycaemia is a problem commonly faced by clinicians in hospital.
- Enteral feeding (EN) and parenteral feeding (PN) during hospital admission was a risk factor for the development of hyperglycaemia, even in patients without previous history of diabetes.
- Hyperglycaemia in these patients was associated with greater risk of adverse outcomes during admission, including higher incidence of infections, sepsis, cardiac complications, acute renal failure and death.

2. Cheung et al Diabetes Care 2005; 28: 2367
Why is this a problem?

- PN-induced hyperglycaemia was shown to be a predictor for in-patient complications and hospital mortality.
- No evidence to suggest that maintaining good glycaemic control in patients receiving EN or PN will result in better clinical outcomes.
What is the purpose of our study?

- The aim of this study:
  - to assess the glycaemic status of patients with DM who received EN during their admission in a tertiary referral centre over a 12-month period
  - whether intervention by SDT will impact on the clinical outcomes of these patients
Methods

- A retrospective medical record review was undertaken for in-patients with known DM who had received continuous EN between 1st January and 31st December 2013 during their admission at Liverpool Hospital.

- EN: nutrition that was provided through naso-gastric or naso-jejunal tubes while the patient was in hospital.

- List of in-patients with DM on EN was provided by the Dietetics Department on a week by week basis.
Methods

- For patients with DM who were receiving EN, blood glucose levels (BGLs) were checked at least four times a day (0600, 1200, 1800 and 0000 hours).

- The admitting teams would decide whether the patient needed input from diabetes team in managing EN-induced hyperglycaemia for their DM patient.

- Diabetes team (DT) comprised an endocrinologist, medical registrar and diabetes nurse educator.
Methods

- No established protocol in managing hyperglycaemia during EN at Liverpool Hospital, but the DT typically used regular insulin starting with 4-6 units given four hourly. If the patient has type 1 diabetes, the patient’s basal insulin (for example, insulin glargine) would be continued.

- A member of the DT would
  - review the patient’s BGL chart daily and make adjustment to insulin doses
  - also oversee diabetes management when the patient was transitioned from EN to normal diet.
Methods

- Patients’ demographic details including age, duration and type of DM, DM therapy and primary reason for admission were recorded.
- BGL measurements in the 24 h before commencing EN, the last 24 h during EN and the first 24 h following cessation of EN were documented.
- Clinical outcomes including LOS, septicaemia, need for ICU admission, new onset CV event and in-patient death were recorded.
- Study approved by the SWSLHD Human Research Ethics Committee.
RESULTS
In 2013, we identified 74 in-patients with diabetes who required continuous EN during admission.

Thirty-nine (52.7%) were under surgical teams, whereas the rest were under the care of physicians.

Four patients suffered from type 1 DM, whereas the rest had type 2 DM.

Mean duration of DM was 15.0 ± 9.4 years.

Twenty patients (27.0%) were on insulin therapy.
## Patient profile

<table>
<thead>
<tr>
<th></th>
<th>Managed by admitting team N=47</th>
<th>Managed by DT N=27</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) ± SD</td>
<td>70.1 ± 10.6</td>
<td>65.7 ± 11.0</td>
<td>0.091</td>
</tr>
<tr>
<td>No. of patients who are male (%)</td>
<td>30 (63.8)</td>
<td>22 (81.5)</td>
<td>0.110</td>
</tr>
<tr>
<td>Duration of diabetes, years ± SD</td>
<td>14.7 ± 9.2</td>
<td>15.4 ± 10.0</td>
<td>0.747</td>
</tr>
<tr>
<td>No. of patients with type 1 diabetes (%)</td>
<td>2 (4.3)</td>
<td>2 (7.4)</td>
<td>0.564</td>
</tr>
<tr>
<td>Diabetes therapy prior to hosp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. on insulin therapy (%)</td>
<td>14 (29.8)</td>
<td>6 (22.2)</td>
<td>0.481</td>
</tr>
<tr>
<td>No. on diet alone (%)</td>
<td>5 (10.6)</td>
<td>1 (3.7)</td>
<td>0.293</td>
</tr>
<tr>
<td>HbA1c -% ± SD</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>7.0 ± 1.1</td>
<td>8.7 ± 2.8</td>
<td>0.001</td>
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<tr>
<td></td>
<td>53 ± 30</td>
<td>71 ± 30</td>
<td></td>
</tr>
<tr>
<td>Admission BGL (mmol/L) ± SD</td>
<td>10.2 ± 5.1</td>
<td>12.1 ± 4.8</td>
<td>0.124</td>
</tr>
<tr>
<td>No. of patients admitted under surgical team (%)</td>
<td>20 (44.1)</td>
<td>15 (55.6)</td>
<td>0.552</td>
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</tbody>
</table>
# BGL profiles

<table>
<thead>
<tr>
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<th>Managed by own team N = 47</th>
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</thead>
<tbody>
<tr>
<td>Mean duration of EN (days) ± SD</td>
<td>21.3 ± 16.0</td>
<td>21.4 ± 14.4</td>
<td>0.991</td>
</tr>
<tr>
<td>Mean BGL during 24 hours before EN (mmol/L) ± SD <em>(Period 1)</em></td>
<td>9.3 ± 2.9</td>
<td>9.8 ± 2.8</td>
<td>0.459</td>
</tr>
<tr>
<td>Mean BGL during EN (mmol/L) ± SD <em>(Period 2)</em></td>
<td>11.1 ± 3.2</td>
<td>8.6 ± 2.0</td>
<td>0.001</td>
</tr>
<tr>
<td>Mean BGL during 24 hours after EN was stopped (mmol/L) ± SD <em>(Period 3)</em></td>
<td>9.7 ± 4.1</td>
<td>7.3 ± 1.7</td>
<td>0.007</td>
</tr>
<tr>
<td>BGL &lt; 4.0 in Periods 2 and 3, no.,(%)</td>
<td>3 (0.81)</td>
<td>2 (1.10)</td>
<td>0.688</td>
</tr>
</tbody>
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## Clinical Outcomes

<table>
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<tr>
<td>Median length of stay (days) (Interquartile range)</td>
<td>37 (23-50)</td>
<td>27 (19-36)</td>
<td>0.047</td>
</tr>
<tr>
<td>New AMI (%)</td>
<td>3 (6.3)</td>
<td>0</td>
<td>0.180</td>
</tr>
<tr>
<td>Blood culture +ve septicaemia (%)</td>
<td>12 (25.5)</td>
<td>5 (18.5)</td>
<td>0.490</td>
</tr>
<tr>
<td>Need for intensive care admission (%)</td>
<td>26 (55.3)</td>
<td>15 (55.6)</td>
<td>0.984</td>
</tr>
<tr>
<td>In hospital mortality (%)</td>
<td>15 (31.9)</td>
<td>3 (11.1)</td>
<td>0.045</td>
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Discussion

- There is no consensus as to what is the best way to manage hyperglycaemia in patients on enteral feeds.
- Endocrine Society (US) guidelines suggest insulin therapy should be initiated when BGL >7.8mmol/L.
- Regimen of insulin can vary widely:
  - Premixed insulin given 2-3 times a day
  - NPH given twice daily (or 4-6 hourly)
  - Basal bolus insulin
Discussion

- At our institution, for continuous enteral feeds, majority of endocrinologists favoured:
  - Regular insulin (Actrapid) every 4-6 hours (start 4-6 units)

- Those with type 1 diabetes – will have basal insulin as per usual on the background

- This regimen
  - Allows frequent titration of insulin doses
  - No increased risk of hypoglycaemia
  - No issue when NGT dislodged or if feeds ceased prematurely
Limitations

- Small retrospective study
- Diabetes Team consultation initiated by the team (not a randomized process)
- The study excluded patients without known DM but who developed hyperglycaemia – their LOS and mortality rates were not available for comparison
- Did not record total insulin doses for patients
Conclusion

- Involvement of Diabetes Team resulted in better glycaemic control amongst patient with DM on enteral feeds

- Some benefits on LOS and mortality

- The regimen of regular insulin q4h +/- basal insulin is shown to be a safe regimen to manage patients on continuous enteral feeds

- A large randomized trial using standardized protocol may be of value
Questions?