Evaluation of Calcitonin Use for Hypercalcemia at Parkview Health

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Evaluation of Calcitonin Use for Hypercalcemia at Parkview Health
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OBJECTIVE

• Evaluate the appropriateness of calcitonin use for hypercalcemia at Parkview Health, a not-for-profit community hospital health system

BACKGROUND

• Hypercalcemia is an oncologic emergency that occurs in up to 30% of patients with active malignancy1 and can lead to life-threatening consequences, like arrhythmias and coma.2
• It is also a common manifestation of hyperparathyroidism.3
• First-line treatment for hypercalcemia is rapid volume expansion with intravenous (IV) crystallized fluids2, followed by bisphosphonates.4
• Calcitonin is an appropriate second line option for patients with severe and symptomatic hypercalcemia that has not been corrected by first-line therapies.5 RANK-L inhibitors are an alternative second line option.6
• The mechanism of action of calcitonin is the inhibition of bone resorption and increased excretion of electrolytes by decreasing calcium and phosphorus reabsorption in the kidney.7
• Calcitonin is available as a nasal and injectable product.8
• It is also a common manifestation of hyperparathyroidism.3
• First-line treatment for hypercalcemia is rapid volume expansion with intravenous (IV) crystallized fluids2, followed by bisphosphonates.4

METHODS

• Retrospective analysis conducted within 8 community hospitals
• Inclusion criteria:
  • Received at least one dose of nasal or injectable calcitonin from January 1, 2019 to December 31, 2020 at any hospital within the Parkview Health system
• Exclusion criteria:
  • Patients < 18 years of age
  • Use for non-hypercalcemic indication
  • Received nasal calcitonin on an outpatient basis
  • Chronic hemodialysis patient
  • Data was extracted from the institution’s electronic medical record and manually validated
• Patients were classified based on corrected calcium value:
  • Mild hypercalcemia: 10.5-11.9 mg/dL
  • Moderate hypercalcemia: 12-13.9 mg/dL
  • Severe hypercalcemia: > 14 mg/dL
• Presence of clinical manifestations of hypercalcemia were manually recorded via chart review (hypertension, bradycardia, excess urine output, nephrolithiasis, vomiting, acute kidney injury (AKI), and altered mental status)
  • AKI was defined as an increase in serum creatinine by 1.5 times baseline or increase by 0.3 mg/dL in 48 hours
• Hypertension and bradycardia were defined as at least 2 episodes of SBP > 130 mmHg or DBP > 80 mmHg or HR < 60 bpm, respectively
• Concomitant and previous utilization of IV fluids, bisphosphonates, and RANK-L inhibitor use(s) were recorded to assess appropriate place in therapy relative to calcitonin doses

RESULTS

• 118 patients screened for inclusion, 21 excluded → 97 patients included in analysis
• Most (81%) excluded patients received calcitonin for osteoporosis

<table>
<thead>
<tr>
<th>Baseline Characteristic</th>
<th>Study Population (N = 97)</th>
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<tbody>
<tr>
<td>Mean age (yr, SD)</td>
<td>67.8 ± 13.2</td>
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<tr>
<td>Mean weight (kg, SD)</td>
<td>81.9 ± 30.3</td>
</tr>
<tr>
<td>BMI Classification (n)</td>
<td>Underweight: 7, Healthy weight: 30, Overweight: 27, Class 1 obesity: 15, Class 2 obesity: 10, Class 3 obesity: 8</td>
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<tr>
<td>Hypercalcemia grade based on corrected calcium (n)</td>
<td>Mild: 14, Moderate: 35, Severe: 46</td>
</tr>
<tr>
<td>Mean serum creatinine (mg/dL, SD)</td>
<td>1.46 ± 0.99</td>
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<tr>
<td>Presence of chronic kidney disease (n, %)</td>
<td>40 (41.2%)</td>
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<tr>
<td>Presence of active malignancy (n, %)</td>
<td>49 (50.5%)</td>
</tr>
</tbody>
</table>

Calcitonin Initial Dosing

<table>
<thead>
<tr>
<th>Disease</th>
<th>Initial Dosing</th>
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</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>Subcutaneous (&lt; 4.3 units/kg) 9%</td>
</tr>
<tr>
<td>Acute kidney injury</td>
<td>Subcutaneous (&lt; 3.7 units/kg) 33%</td>
</tr>
<tr>
<td>Hypercalcemia</td>
<td>Injectable 3%</td>
</tr>
</tbody>
</table>

DISCUSSION & CONCLUSIONS

• Fourteen (14.4%) patients were classified as having severe, symptomatic hypercalcemia refractory to first-line therapies, thus appropriate for calcitonin administration
• No patients in this population received a RANK-L inhibitor, which is expected, as these agents are restricted to outpatient use per hospital policy
• Based on this medication use evaluation, there is opportunity for process improvement to standardize care
• Limiting calcitonin to second line use will promote guideline management of hypercalcemia and yield significant cost savings
• Eliminating nasal calcitonin use for hypercalcemia will avoid delays in appropriate care
• Limitations:
  • Use of manual chart search to identify clinical manifestations is limited by variable phrasing used by physicians that differs from the predefined chart search terms
  • Many patients were discharged before achieving eucalcemia, resulting in difficulty assessing overall calcitonin efficacy
  • Dosing protocols are needed to promote the appropriate use of injectable calcitonin for hypercalcemia

REFERENCES
