POST-CHEMOTHERAPY MEASLES, MUMPS AND RUBELLA TITERS IN A PEDIATRIC POPULATION

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Background

- Chemotherapy causes immune suppression, including:\textsuperscript{1,2}
  - A decrease in memory B-cells
  - A decrease in plasma cells in the bone marrow
  - A fall in immunoglobulin levels
- Children become susceptible to infectious processes, many of which they have been vaccinated against.
Why MMR?

- Ontario is experiencing higher than normal measles activity in 2015, with 20 incident cases as of June 3\textsuperscript{rd}, compared to 22 cases in 2014.\textsuperscript{3}
- Immunity rates in general population are 95-97\% for MMR.\textsuperscript{4}
- No consensus in the literature regarding what percentage of children are susceptible to MMR post-chemotherapy.
Objectives

1. To establish the percentage of children that are immune to MMR post-chemotherapy.
2. To determine the response to re-immunization in children who are not immune post-chemotherapy.
Currently at KGH

- Pediatric oncology patients have titers tested at 6 months post-chemotherapy.
- Non-immune children are re-vaccinated with MMR and re-tested 6 months later.
- Maximum of 3 vaccines, regardless of titer results due to potential risk of rubella arthropathy.
Methods

• Retrospective chart review

• Inclusion criteria
  • KGH pediatric oncology patient diagnosed between January 2001 and December 2014

• Exclusion criteria
  • Had not received chemotherapy
  • Currently receiving chemotherapy
  • Under 1 year at diagnosis
Demographics

- 74 patients were included in the main analysis
- Patients who had received a bone marrow transplant (BMT) or a second round of chemotherapy post-relapse were analyzed separately.

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<th>Age @ Dx</th>
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<td>&gt;6</td>
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<th>Leuk/Lymph</th>
<th>Solid</th>
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<td>30</td>
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Results

Figure 1:

Starting Cohort

74

Immune

29

Non Immune

Post-Chemotherapy

45

Immune

12

Titors not Completed

Immune

Non Immune

After 1st MMR Vaccine

18

Immune

5

Non Immune

Titors not Completed

After 2nd MMR Vaccine

15

Immune

8

Non Immune

After 3rd MMR Vaccine

5

Immune

0

Non Immune

Titors not Completed

2

26

= 46 Immune

= 2 Non Immune

= 26 Titors not Completed
Results

Starting Cohort

74
Results

- 39% retained immunity to all three viruses.
- The remaining 45 patients were given MMR vaccine and re-tested in 6 months.
MMR Breakdown

• Of the 45 non-immune patients:
  • 29 were immune to 2/3 viruses
  • 16 were immune to 1/3 viruses
  • 6 were not immune to any virus

• Measles vs. Mumps vs. Rubella
  • 20 were lacking measles immunity
  • 36 were lacking mumps immunity
  • 17 were lacking rubella immunity
Results

- 12 seroconverted
- 18 remained non-immune
- 15 did not have titers taken due to relapse, error or an insufficient amount of time elapsed since the last vaccine.
Results

***Of the two patients that remained non-immune, one was not up-to-date on immunizations prior to diagnosis.
Results

- Patients had a higher likelihood of losing immunity to mumps, as opposed to measles or rubella (p=0.002).
- No statistically significant differences were found between sex, age group or cancer type.
Discussion

- Some recommend fixed schedule 1-2 vaccines without checking titers.\textsuperscript{2, 5}
  - Advantage: fewer lost to follow up
  - Disadvantage: insufficient in some, unnecessary in others
- One vaccine is not enough for many children.
  - Only 41 (55\%) were immune after 1 vaccine (15 unknown)
Discussion

Trends in protective titer findings (not statistically significant):

1. Cancer type
   - Leukemia/Lymphoma (34%) vs. Solid (46%) post-chemo

2. Age
   - 1-3 (35%) vs. 4-6 (44%) vs. >6 (39%)
Conclusions

• Over half of pediatric oncology patients lose immunity to MMR post-chemotherapy
• Following the stringent re-immunization protocol utilized, almost all patients regained MMR immunity.
• However, those in whom the protocol was not completed represent a potentially vulnerable group that should be addressed.
QUESTIONS?