FPIN's Clinical Inquiries

Immunogenicity of Childhood Vaccines after Pediatric Cancer

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Clinical Question

Do children who have undergone treatment for cancer retain immunity from childhood vaccinations?

Evidence-Based Answer

Children treated for cancer do not retain full immunity from previous vaccinations; therefore, it is likely beneficial for children who survive cancer to be revaccinated six to 12 months after immunosuppressive therapy. (Strength of Recommendation [SOR]: C, based on disease-oriented outcomes and consensus guidelines.) A measles, mumps, and rubella (MMR) booster is recommended for children who have undergone treatment for acute lymphoblastic leukemia, especially those who were diagnosed and treated before five years of age. A dose of 13-valent pneumococcal vaccine (PCV-13) is recommended after completion of immunosuppressive therapy, and a dose of hepatitis B vaccine is recommended six months after completion of chemotherapy. Universal revaccination should be considered because it is likely more cost-effective than titer-directed revaccination. (SOR: C, based on disease-oriented outcomes and consensus guidelines.)

Evidence Summary

A 2018 retrospective, cross-sectional Saudi Arabian study of 57 children who had undergone treatment for acute lymphoblastic leukemia and had received all scheduled MMR vaccinations evaluated MMR immunity at least 12 months posttreatment and the subsequent response to a booster vaccination.[1] Posttreatment baseline titers showed that 35 patients (61.4%) were seropositive/immune to all three vaccine components and that 22 (38.6%) were negative/susceptible to at least one vaccine component. The 22 seronegative children were given one MMR booster, and titers were redrawn six to nine months afterward. Postbooster seroconversion rates were 57.1% for measles, 87.5% for mumps, and 78.6% for rubella, which are lower than initial postvaccine seroconversion rates. No significant differences in baseline characteristics were found between responders and nonresponders. No serious adverse effects were reported. Patients diagnosed before five years of age were more likely to initially be seronegative than those diagnosed after five years of age (19.3%, 24.6%, and 21.1% vs. 5.3%, 3.5%, and 3.5%, respectively).

A 2017 prospective, cohort Australian study evaluated the use of PCV-13 in 85 children who were undergoing active immunosuppressive therapy or who had completed immunosuppressive therapy within the previous 12 months.[2] Cancer diagnoses included 59% hematologic and 41% solid tumor malignancies. Patients who completed immunosuppressive therapy and received a subsequent PCV-13 vaccine were excluded. Prebooster evaluation found that at least 50% of

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patients had protective antibody titers to 10 serotypes of *Streptococcus pneumoniae* in the active treatment group and eight serotypes in the completed treatment group. Baseline seroconversion rate was approximately 90%. Both groups were given one PCV-13 booster, and repeat antibody titers were drawn four weeks later. Postvaccination studies found at least 70% protective titers for nine and 11 serotypes in the active and completed groups, respectively. A significantly higher proportion of the completed group achieved seroprotective titers to PCV-13 serotypes. There was a low rate of common adverse effects. Three patients from the active group had serious adverse effects, including one who was diagnosed with *S. pneumoniae* sepsis (nonvaccine serotype 15C).

A 2017 retrospective, cross-sectional study of 43 Middle Eastern children who had undergone chemotherapy for cancer examined whether hepatitis B–seronegative patients were able to achieve therapeutic anti–hepatitis B surface antibody (anti-HBs) titers, and it gauged the necessity of drawing titers before revaccination.[3] Participants included 22 children (51.3%) who had hematologic malignancies, 13 (30.2%) who had lymphoma, and four (9.3%) each with solid or brain tumors. Participants had undergone chemotherapy six months previously, completed the hepatitis B vaccination series before chemotherapy, and had an anti-HBs titer to determine the need for revaccination. This study found that 37 of 43 patients (86%) were seronegative for anti-HBs and required a booster. There is typically a 95% seroconversion rate after the initial series. Of the 32 patients who were revaccinated, 29 (90.6%) needed only one booster to reach hepatitis B seropositive status.

Recommendations from Others

The American Academy of Pediatrics recommends booster doses of vaccinations in children after treatment for acute lymphoblastic leukemia and complete revaccination after stem cell transplant.[4,5] To provide partial protection during treatment, live vaccines should be given at least four weeks before initiation of immunosuppression, and inactivated vaccines should be given at least two weeks prior. After completion of immunotherapy, appropriate timing of live and inactivated vaccines could range from three to 24 months, depending on the vaccine and type of immunosuppression. General consensus on an acceptable timeframe for posttreatment vaccine administration is six months for chemotherapy and 12 months for stem cell transplant.

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