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MEASLES-MUMPS-RUBELLA VACCINATION IN A PAEDIATRIC TRANSPLANT PATIENT USING EVEROLIMUS

EVEROLIMUS KULLANAN BİR PEDİATRİK TRANSPLANT OLGUSUNDA KIZAMIK-KABAKULAK-KIZAMIKÇIK AŞISI UYGULAMASI

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ABSTRACT

There is limited information regarding the administration of live vaccines to paediatric transplant patients who are at increased risk of infection. A 7-year-old liver transplant patient who had everolimus therapy was evaluated for Measles-Mumps-Rubella (MMR) vaccination. After checking the lymphocyte count, immunoglobulin G, and serum everolimus levels, the MMR vaccine was administered. No side effects were observed during follow-up, and the antibody levels were found to be positive after two months. This article presents a case of paediatric solid organ transplantation patient who received a measles-mumps-rubella vaccination while receiving immunosuppressive everolimus therapy.

Keywords: Child, vaccination, everolimus, solid organ transplantation

ÖZET

İnfeksiyon riskinin artmış olduğu pediatrik transplantasyon hastalarında canlı aşıların uygulanması ile ilgili bilgiler sınırlıdır. Yedi yaşında, halen evorolimus kullanmakta olan karaciğer nakli hastası Kızamık-Kabakulak-Kızamıkçık (KKK) aşısı yapılmak amacıyla değerlendirildi. Lenfosit sayısı, immünoglobulin G ve serum everolimus düzeyleri kontrol edildikten sonra KKK aşısı uygulandı. İzlemde yan etki saptanmayan olguda, iki ay sonra bakılan antikor düzeyleri pozitif bulundu. Bu yazıda immünosupresif everolimus tedavisi alırken Kızamık-Kabakulak-Kızamıkçık aşısı uygulanan bir pediatrik solid organ nakli olgusu sunulmaktadır.

Anahtar Kelimeler: Çocuk, aşılama, everolimus, solid organ nakli

INTRODUCTION

Children who receive solid organ transplants (SOTs) are at an increased risk of vaccine-preventable infections. Although the use of live attenuated vaccines in children after SOT is still controversial, there is increasing literature showing that live attenuated vaccines are safe and effective in selected cases receiving immunosuppressive therapy after transplantation (1). In this article, we present a paediatric solid organ transplantation patient who was given a measles-mumps-rubbella (MMR) vaccination while receiving immunosuppressive everolimus treatment.

CASE PRESENTATION

A 7-year-old liver transplant patient was evaluated for the Measles-Mumps-Rubella (MMR) vaccine. The patient, who underwent transplantation at 11 months of age, was given inactivated vaccines six months and varicella vaccine three years after the transplant while on tacrolimus treatment. The patient, who had no history of rejection, had been using everolimus instead of tacrolimus for two years due to recurrent angioedema and had not received any other treatment or blood products. His lymphocyte count was 1620/mm^3, IgG was 620 mg/dl, CD4/CD8 ratio was 1.68%, and the last two serum everolimus levels were 3 ng/mL

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and 2.7 ng/mL. After obtaining consent from the family, the MMR vaccine was administered to the serologically negative case, and no side effects related to the vaccine were detected. Specific IgG antibodies were measured using the chemiluminescent immunological method (CLIA) with the VIRCLIA® KIT assay after two months of vaccination. Values above the 1.0 signal cut-off ratio (S/CO) were considered positive (2). The MMR vaccine was found to be immunogenic in the patient on everolimus treatment, as the antibody titres for measles, mumps and rubella were found to be 1.5, 2.2 and 30.5 S/CO, respectively.

DISCUSSION

Children receiving SOTs are likely to have an increased risk of vaccine-preventable infections. The considerable morbidity, mortality and costs associated with these infections highlight the importance of immunisation of all transplant candidates and recipients, especially children aged two years and younger (3). During outbreaks, transplanted children are at a high risk of exposure to measles and are more likely to develop life-threatening complications such as pneumonia, encephalitis and myocarditis (4).

The recommended essential criteria for the administration of attenuated live vaccines after SOTs have been a-established/presented in Pediatric Transplantation consensus meeting (5). MMR vaccine (except combined MMRV) is considered safe in patients more than one year after liver or kidney transplantation and two months after an episode of acute rejection, who are clinically stable, can be closely monitored, and meet certain criteria for "low-level" immunosuppression as defined in the guidelines; for steroids (prednisone equivalent) <2 mg/kg/d or total cumulative <20 mg/d, for tacrolimus <8 ng/mL for two consecutive readings and for cyclosporine <100 ng/mL for two consecutive readings. Patients also need to meet the minimum immune criteria defined by absolute lymphocyte count (ALC) >1500 for children ≤6 y and >1000 cells/μL for children >6 years, CD4 >700 cells/μL for children ≤6 y and >500 cells/μL for children >6 years and normal total serum IgG levels for age (5). In our case, the MMR vaccine was administered six years after transplantation and after evaluating the IgG levels, lymphocyte count, lymphocyte profile tests, and everolimus levels.

There is no clear information about what blood level of everolimus is considered low immunosuppression. The target blood everolimus level to prevent rejection has been reported to be 3-8 ng/ml when used in combination with low-dose tacrolimus and 5-10 ng/ml when used alone (6-8). The only paper in the literature regarding the administration of live vaccines during everolimus treatment reported that the MMR vaccine was safe and immunogenic in children who had undergone liver transplantation. In this study, two consecutive serum everolimus levels <5 ng/ml were accepted as the criteria for live vaccine administration (9). In our patient who was switched from tacrolimus to everolimus because of angioedema, everolimus levels were below the minimum blood concentration levels indicated in the studies, and the level at the time of vaccine administration was the lowest in the last 3 months.

A recent study has revealed that immunisation with live attenuated vaccine showed a high seroconversion rate for those who met the clinical criteria after liver transplantation (10). In another research, the seroprotection rates for measles, rubella, mumps, and varicella were generally low in children after the first post-transplant accination and a significant number of recipients required re-vaccination. Serological evidence of seroprotection following immunisation should be routinely checked (11). In our case, seroconversion occurred after a single dose of the MMR vaccine.

To date, it has been reported that a live attenuated vaccine has been administered to 2091 people who receive immunosuppressive drugs (1). Twenty-three patients (1.1%) became infected with the virus strain used in the vaccine, which was the varicella virus in 21 patients. No serious life-threatening complications have been reported. Shinjoh et al. reported no severe side effects after live attenuated vaccination in 48 paediatric patients undergoing living donor liver transplantation. Transient swelling of the parotid glands was reported in two cases after mumps vaccination, and fever was reported in two cases 2-3 weeks after measles vaccination, but no measles symptoms were observed in the patients (10). In our case, no side effects were observed after vaccination.

Various factors such as level of immunosuppression, infrequent consultation with primary care physicians, and lack of awareness of the vaccination status among specialists lead to low vaccination rates. The new literature on live-attenuated vaccines in post-transplant paediatric patients provides more insight into the vaccines' safety and efficacy, and communication between specialists and primary care physicians plays a key role in optimising immunisation of immunocompromised patients (12).

CONCLUSION

The MMR vaccine is safe and immunogenic in the presence of "low-level" immunosuppression in paediatric patients receiving everolimus after living donor liver transplantation. The increase in the number of cases similar to our patient, who is one of the few in the literature, is important in establishing guidelines for the administration of live vaccines in transplant patients.

Informed Consent: Written informed consent was obtained from patients' parents who participated in this case

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REFERENCES

1. Kamei K. Live attenuated vaccines in patients receiving immunosuppressive agents. Pediatr Nephrol 2023;38(12):3889-900. [CrossRef]
2. Coppeta L, Ferrari C, Somma G, Giovinazzo V, Buonomo E, Trabucco Aurilio M, et al. Serological evaluation for measles among Italian and foreign medical students in a University Hospital in Rome. Vaccines 2023;11(7):1256. [CrossRef]
3. Feldman AG, Beaty BL, Curtis D, Juarez-Colunga E, Kempe A. Incidence of hospitalization for vaccine-preventable infections in children following solid organ transplant and associated morbidity, mortality, and costs. JAMA Pediatr 2019;173(3):260-8. [CrossRef]
4. Liu Y, Sun LY, Zhu ZJ, Lin W, Qu W, Zeng ZG. Measles virus infection in pediatric liver transplantation recipients. Transplant Proc 2015;47(9):2715-8. [CrossRef]
5. Suresh S, Upton J, Green M, Pham-Huy A, Posfay-Barbe KM, Michaels MG, et al. Live vaccines after pediatric solid organ transplant: Proceedings of a consensus meeting, 2018. Pediatr Transplant 2019;23(7):e13571. [CrossRef]
6. Manzia TM, Antonelli B, Carraro A, Conte G, Guglielmo N, Lauterio A, et al. Immunosuppression in adult liver transplant recipients: a 2024 update from the Italian Liver Transplant Working Group. Hepatol Int 2024;18(5):1416-30 [CrossRef]
7. Shipkova M, Hesselink DA, Holt DW, Billaud EM, van Gelder T, Kunicki PK, et al. Therapeutic drug monitoring of everolimus: A consensus report. Therapeutic Drug Monitoring 2016;38(2):143. [CrossRef]
8. Witzke O, Sommerer C, Arns W. Everolimus immunosuppression in kidney transplantation: What is the optimal strategy? Transplant Rev (Orlando) 2016;30(1):3-12. [CrossRef]
9. Keskindemirci G, Önal Z, Özbörü Aşkan Ö, Yücel E, Varol S, Hançerli Törün S, et al. Attenuated live vaccine in children with solid organ transplantation on everolimus therapy: Report of two cases. Pediatr Transplant 2023;27(2):e14426. [CrossRef]
10. Shinjoh M, Hoshino K, Takahashi T, Nakayama T. Updated data on effective and safe immunizations with live-attenuated vaccines for children after living donor liver transplantation. Vaccine 2015;33(5):701-7. [CrossRef]
11. Kawano Y, Suzuki M, Kawada J ichi, Kimura H, Kamei H, Ohnishi Y, et al. Effectiveness and safety of immunization with live-attenuated and inactivated vaccines for pediatric liver transplantation recipients. Vaccine 2015;33(12):1440-5. [CrossRef]
12. Hartley C, Thomas T, Smith SK, Karnsakul W. Live-attenuated vaccines in pediatric solid organ transplant. Vaccines 2024;12(4):376. [CrossRef]