



Anesthesia/Surgery and Vaccination

Anestezi/Cerrahi Operasyon ve Aşılama

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Question 1: Does pre-operative vaccination timing is important in infants with routine vaccination schedules? **Edanur Gezer, MD**

Question 2: Can there be a problem if the child whose vaccination status is not questioned has been operated immediately after the vaccination?

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Question 3: Does administration of vaccines immediately after anesthesia reduce the effect of the vaccine? **Hilal Demir, MD**

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Answer (Edanur Yeşil, MD; Mustafa Hacımustafaoğlu, MD)

The aforementioned questions and questions related to one another will be answered mutually.

Anesthesiologists, surgeons and pediatricians often encounter the child for emergency or elective surgery, who has recently been immunized with vaccine. Anesthesia and vaccination may cause confusing questions in terms of setting the time between the two, and also the effect and side effect of vaccination. These problems are; post-vaccine general anesthesia and/or surgery risk, general anesthesia and/or post-operative routine vaccination schedule timing, the misunderstanding that general anesthesia and/or operation complications may be confused with the post-vaccine side effects. In this context, pediatric anesthesia and pediatric infection expert opinion is important in cases that may cause problems.

When an antigen enters the body, both innate and acquired immunity are activated. Innate immunity provides stimu-

lation of B and T lymphocytes through antigen presenting cells as well as its anatomical and chemical barrier. B lymphocytes stimulate humoral, acquired immunity by forming antigen-specific antibodies. Antigen-specific T lymphocytes support humoral immunity and prevent the spread of the disease. Immunization is achieved by immunization via antigen presenting cells, particularly dendritic cells. Inactivated vaccines generate immunity by the migration of antigen presenting cells to lymph nodes via dendritic cells and this effect is enhanced by booster doses. In live vaccines, in addition to dendritic cells, B and T lymphocytes stimulate immunity, resulting in a stronger response than inactive vaccines.

Effects of general anesthesia and related drugs and/or surgery on immunization: General anesthesia/anesthetic drugs and/or surgery may cause impaired immune response in children and adults. Preoperative anxiety, surgical tissue damage, hypoperfusion in the microcirculation, hyperglycemia, hypothermia and pain may also have an immunosuppressive effect. This effect may be more pronounced in neona-

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tes and infants. General anesthesia suppresses immune system directly, in addition to indirectly by the hypothalamic-pituitary-adrenal axis through the sympathetic nervous system. Catecholamine secretion and cortisol-induced macrophage, T cell response and suppression of antibody production may be affected for prolonged periods up to 4-12 days. Especially in cancer patients, anesthesia-induced immunosuppression may result in metastasis and growth of residual malignant cells as a result of dysfunction of NK (natural killer) and lymphocytes.

Anesthetic agents have been shown to inhibit leukocyte bactericidal function, cytokine release, lymphocyte proliferation, complement fixation and neutrophil intracellular killing mechanisms, but do not affect immunoglobulin (IgG, IgA, IgM) production by B cell proliferation. It is known that it inhibits, reduces Th lymphocyte differentiation, depresses NK cell function. However, synthetic opioids (remifentanyl, sufentanyl and fentanyl) have little or no immunosuppressive effect.

Immunosuppression due to general anesthesia/anesthetic drugs is often short-lived (hours to several days). The complete development of immune responses after vaccination may take days or weeks to be shorter in repeat/booster vaccines. Therefore, it is thought that the clinical significance of the possible effects of immunosuppression due to general anesthesia/general anesthesia drugs on the immune response of vaccines have low possibility.

Adverse effects of vaccines due to general anesthesia or operation: If the vaccination is given very close to the operation (for example, operation within a few days after vaccination), side effects (fever, malaise, local side effects, etc.) may be confused with general anesthesia/general anesthetic drugs or operation related side effects. In particular, it may cause difficulties in the evaluation of post-op infection. Since there is no vaccine-induced immunosuppression, no surgical complications (delayed wound healing, increased post-op infection, etc.) are expected. In such cases, however, it is necessary to carefully examine whether the present symptoms (such as fever) are due to the vaccine or general anesthesia/surgery. In case of problems, it is appropriate to ask for child infection specialist consultation. It should also be borne in mind that it is essential to administer tetanus and/or rabies vaccines as soon as possible, regardless of anesthesia/operation, even if there is a major operation requiring these vaccines prophylaxis.

The Advisory Committee of Immunization Practise (ACIP) of the Center for Disease Control and Prevention (CDC) recommends that pneumococcal, meningococcal and *Haemophilus influenzae* type B vaccines should be administered at least two weeks prior to elective splenectomy, if the vac-

ines have not been administered prior to surgery, it should be applied as soon as possible, before a time has been defined, before discharge as soon as the person has stabilized after surgery.

The American Academy of Pediatrics recommends that pre-operative vaccination does not constitute surgical contraindications, or that vaccination should be encouraged to avoid vaccination interruptions in the post-discharge period, before or immediately after discharge. If there is a history of blood or blood product transfusion before/during/after the operation, the vaccine should be postponed as there may be interaction between the transfused product and measles, measles-rubella-mumps (MMR) or chickenpox live vaccines. This delay can be extended to 0 months in washed erythrocyte transfusion, 7 months in plasma or platelet transfusion, and up to 11 months with high dose immunoglobulin (2 g/kg). However, this situation is not related to general anesthesia/operation but also applies to children who receive blood or blood products for other reasons.

The Association of Pediatric Anesthesia of Great Britain and Ireland (APAGBI), in its current guidelines, postpones elective operations after inactive vaccines for 48 hours due to the possibility of confusion of surgical-related symptoms. If the live vaccine is administered and the child is well, there is no need to delay the operation. This latest and updated guide is not an additional recommendation for emergency operations, and in the case of elective surgery, it is recommended to postpone the elective operation only for a minimum period after inactive vaccines. After the Society for Pediatric Anesthesia of New Zealand and Australia (SPANZA) anesthesiologists' questionnaire on the relationship between immunization and anesthesia in 2006, the proposal suggested that elective surgery should be delayed one week after inactivated vaccination and three weeks after live vaccination. However, this opinion was later abandoned in the new guide.

In a review prepared by anesthesiologists in 2017, it was suggested that elective surgeries should be postponed until the routine vaccination schedule was completed, one week after inactive vaccination and three weeks after live vaccination. Regional anesthesia should be preferred instead of general anesthesia, close monitoring of the patient and synthetic opioids should be used instead of morphine. In addition, it was recommended that vaccination should be performed at least one month after the surgery in order to achieve effective response and to avoid surgical complications. However, our opinion is that there is no evidence-based data in these recommendations.

In our country, The Association of Anesthesiology of Turkey's (TARD) Preoperative Preparation Guide, which was pub-

lished 2005, since vaccination may cause local reactions, it is recommended to pay attention to the vaccination site and to take into consideration the fever due to near vaccination in the elective case. It was recommended to postpone elective surgery for one week from DtaB vaccine and 2 weeks after *H. influenzae* type B and MMR vaccines. However, the source/reference of this proposal is not specified. The current TARD Pediatric Preoperative Evaluation Guide updated in 2015 does not include the relationship between vaccine and surgery.

Comments and Suggestions

Evidence-based data on clinical practice in this subject are limited. There is no standard consensus in different countries and guidelines in the world. In this context, our recommendations; in line with the American Academy of Pediatrics and the current guideline of Association of Pediatric Anesthesia of Great Britain and Ireland (APAGBI). They can be summarized as follows:

1. There is no restriction on vaccine administration in urgent surgical operations (preop, postop, live/inactive).

2. In elective operations; Especially for inactive vaccines, it is recommended to wait for two days, if possible, before operation. This time will also be useful for the evaluation of vaccine side effects and complications of general anesthesia/anesthetic drugs and/or surgery.

3. There is no limitation in the post-operative vaccine applications. After the operation, in accordance with the general vaccine recommendations, it is recommended that the required vaccine be given after the patient is stable and preferably before discharge.

4. Immediate completion of vaccines in accordance with the vaccination schedule in order to avoid missed opportunities in vaccination and not to create weaknesses in terms of both individual and herd immunity; it should be considered as a human right, a right to health and a public health gain.

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