

The relationship between preoperative serum immunoglobulin levels and the development of bacteremia after tonsillectomy

Ameliyat öncesindeki serum immünglobülin düzeyleri ile tonsillektomi sonrasında bakteriyemi gelişmesi arasındaki ilişki

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Objectives: We examined the risk for the development of bacteremia during tonsillectomy and evaluated the presence of an association between bacteremia and preoperative serum immunoglobulin levels.

Patients and Methods: The study included 40 patients (16 males, 24 females; mean age 16.8 years; range 5 to 35 years) who underwent tonsillectomy with the use of the dissection-sneer technique. Preoperatively, venous blood samples were collected from all the patients to determine serum immunoglobulin levels and the presence or absence of bacteremia. Bacteremia was also investigated in blood samples postoperatively.

Results: There was no growth in the preoperative blood cultures, but bacteremia was documented in 10 patients (25%) after tonsillectomy. Increased serum IgG levels were determined in 15 patients before operation, seven of whom developed bacteremia after tonsillectomy ($p<0.05$). There was no correlation between postoperative bacteremia and preoperative serum IgM or IgA levels ($p>0.05$).

Conclusion: Although our current knowledge does not allow to predict bacteremia following tonsillectomy in advance, the finding that seven of 10 patients who developed bacteremia had increased preoperative IgG levels draws attention to serum IgG, especially in patents in whom bacteremia may present additional risks.

Key Words: Antibodies, monoclonal/diagnostic use; immunoglobulin G; tonsil/ immunology/complications; tonsillectomy/complications.

Amaç: Tonsillektomi sırasında bakteriyemi gelişim riskini gözden geçirmek ve bakteriyemi ile ameliyat öncesi serum immünglobülin düzeylerinin olası bağlantısını değerlendirmek.

Hastalar ve Yöntemler: Çalışmaya tonsillektomi endikasyonu konan ve sneer diseksiyon tekniği yoluyla tonsillektomi uygulanan 40 hasta (16 erkek, 24 kadın; ort. yaş 16.8; dağılım 5-35 years) alındı. Tüm hastalardan ameliyat öncesinde alınan venöz kan örneklerinde serum immünglobülin düzeyleri araştırıldı ve kültür sonuçları değerlendirildi. Ameliyat sonrası alınan örneklerde bakteriyemi varlığı araştırıldı.

Bulgular: Ameliyat öncesindeki kan kültürlerinin hiçbirinde üreme olmamasına karşın, tonsillektomi sonrasında kan örneklerinin %25'inde bakteriyemi saptandı. Serum IgG düzeyinin ameliyat öncesinde 15 hastada yüksek olduğu belirlendi; bu hastaların yedisinde tonsillektomi sonrasında bakteriyemi gelişti ($p<0.05$). Ameliyat sonrası bakteriyemi ile ameliyat öncesi IgM ve IgA düzeyleri arasında korelasyon yoktu ($p>0.05$).

Sonuç: Bugünkü bilgilerimize göre, tonsillektomi ameliyatı sonrasında gelişen bakteriyemi ameliyat öncesinde belirlemek mümkün olmasa da, bakteriyemi gelişen 10 hastanın yedisinde serum IgG düzeyinin yüksek bulunması, özellikle bakteriyeminin ek risk oluşturacağı hastalarda dikkati IgG'ye çekmektedir.

Anahtar Sözcükler: Antikor, monoklonal/tanısal kullanım; immünglobulin G; tonsil/immünoloji/komplikasyon; tonsillektomi/komplikasyon.

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Tonsils, whose lymphoid tissue hosts B and T lymphocytes play important roles in the immune system.^[1] Tonsils are excellent sources of B cells to examine *in vitro* production of immunoglobulins. They have been considered to be an important *in vivo* source of antibodies against oral and respiratory antigens.^[2] Nevertheless, immunological functions of tonsils and their relation to general immunity have not been fully elucidated. Therefore, indications of tonsillectomy operations, optimum age of the patient for operation, and the effect of removal of tonsils on the immune system are still controversial.^[3,4]

Children attain normal levels of IgM in their first, IgG in the fifth-seventh year of life, and IgA when they reach puberty. IgA is almost absent in newborns and an effectively protective level in mucosa is acquired at the end of the first year.^[1,2]

Dissection is frequently employed in tonsillectomy operations which account for 38.5% of all head and neck operations. Bacterial dissemination easily occurs in these operations since wound surfaces are open.^[5]

Serious complications related to tonsillectomy are reported to be 1.5%.^[6,7] Development of localized specific complications and bacteremia are also reported.^[8-10] Although bacteremia is somewhat a harmless complication for healthy individuals, it may result in drastic scenarios in patients at risk for a cardiovascular infection. Therefore, prophylactic antibiotic use is commonly utilized before tonsillectomy operations.

In this study, we evaluated the risk for the development of bacteremia due to tonsillectomy operations and investigated whether any relationship existed between postoperative bacteremia and preoperative serum Ig levels in tonsillectomy patients.

PATIENTS AND METHODS

The study included 40 patients (16 males, 24 females; mean age 16.8±9.0 years; range 5 to 35 years) who were admitted to the ENT Clinics of Firat University. All the patients had an indication of tonsillectomy according to tonsillectomy criteria of Pittsburgh School^[11] and did not have a history of any antibiotic use during one month before the operation. Tonsillectomy operations were performed via the classic dissection-snare technique under general anesthesia and optimum operative conditions.

In preoperative and postoperative periods, venous blood samples were collected from children (5 ml) and adults (10 ml). Blood samples were immediately divided into two portions and placed into culture bottles prepared for aerobic and anaerobic microorganisms. In addition, 5 ml of venous blood sample was obtained in the preoperative period to determine serum Ig levels. All the samples were submitted to the microbiology laboratory within 30 minutes.

Blood samples were analyzed with the BacT Alert (Organof Tekniko Corp. NC 27704, USA) automatized blood culture system. IgG, IgA and IgM levels were determined with the use of Beckman Assay 360 Systems (Beckman, California, USA), which utilizes kits based on nephelometric method. The results were expressed as g/l.

The relationship between tonsillectomy and tonsillectomy-related bacteremia was analyzed using the chi-square test. Spearman's correlation test was used to examine the relationship between serum immunoglobulin levels and bacteremia.

RESULTS

Preoperative blood cultures yielded no growth of microorganism. However, bacterial growth was observed in 10 blood samples (25%) after tonsillectomy operations. Data regarding growth of bacteria in the postoperative blood cultures are summarized in Table I.

In the preoperative serum samples, IgG levels were high in 15 patients. IgM levels were within normal ranges. IgA levels were found to be within normal ranges in 34 patients, whereas four patients exhibited above normal, and two patients exhibited below normal values.

When serum Ig levels of 10 patients who developed bacteremia were evaluated, serum IgG levels were found to be high before operation. Serum IgA and IgM levels were within normal ranges. A significant positive correlation was found between bacteremia and serum IgG levels ($r: 0.875, p < 0.05$). IgM and IgA levels were not correlated with the development of bacteremia ($p > 0.05$).

DISCUSSION

Although the development of bacteremia varies depending on the type of surgical operation, it is one of the most important complications seen in the

TABLE I
DISTRIBUTION OF ORGANISMS ISOLATED FROM
POSTOPERATIVE BLOOD CULTURES

Microorganism	Patient (n)	Organism (n)
One microorganism	4	–
Aerobic	–	–
<i>Staphylococcus aureus</i>	–	2
<i>Streptococcus pneumoniae</i>	–	1
Anaerobic	–	–
<i>Peptostreptococcus spp.</i>	–	1
Polymicroorganism	6	–
Aerobic	–	–
<i>Neisseria spp.</i>	–	6
<i>S. pneumoniae</i>	–	4
<i>Diphtheroid spp.</i>	–	4
<i>Alpha-hemolytic streptococci</i>	–	1
<i>S. aureus</i>	–	1
Anaerobic	–	–
Total	10	20

postoperative period. Bacteremia may develop after tonsillectomy operations.^[9] Since wounds are open in tonsillectomies performed via the dissection method, invasion of bacteria into the tissues and blood vessels in the pharyngeal mucosa may result in bacteremia.^[12] The incidence of bacteremia after tonsillectomy was reported to be 37.5%.^[8] In our study it was 25%.

Bacteremia is associated with serious problems in patients with cardiovascular diseases, although it does not result in severe problems in healthy individuals. In particular, bacteremia caused by *Streptococcus pyogenes* was reported to lead to mortality due to endocarditis, arthritis, and osteomyelitis even in the presence of antibiotic treatment.^[7]

Isolation of anaerobic bacteria is low, and this has been attributed to the different techniques used.^[8] Francois et al.^[8] reported that they were not able to isolate any anaerobic bacteria in a series of 32 patients. In our study, we isolated anaerobic bacteria in only one patient.

Several studies reported high serum IgG levels in patients with chronic tonsillitis compared to controls. This is attributed to continuous stimulation of tonsils as a source of infection.^[13-15] In our study, preoperative serum IgG levels were high in 15 patients ($p < 0.05$).

Some researchers reported increased preoperative serum IgA levels in patients with chronic tonsillitis.^[13-17] In our study, IgA levels were normal in 34 patients, increased in four patients, and decreased in two patients. Patients who exhibited low IgA levels were children.

Although there are reports on elevated serum IgM levels before surgery,^[13,14] we did not find any significant changes in IgM levels in our patients ($p > 0.05$).

In our study, postoperative bacteremia was detected in 10 patients (25%) after tonsillectomy. Of these, serum IgG levels exceeded the normal range in seven patients ($p < 0.05$). Nevertheless, no bacteremia-associated problems were encountered in these patients. However, it must be kept in mind that bacteremia may result in drastic problems especially in patients with cardiovascular diseases.

Although it is not possible to estimate bacteremia preoperatively in tonsillectomized patients, the finding that a significant correlation exists between bacteremia and preoperative serum IgG levels may be helpful especially in patients who are at risk for cardiovascular infections.

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