Remembering the Importance of an Old Friend: History Taking in Preoperative Evaluation of Healthy Children: A Single Center Experience

Sağlıklı Çocuklarda Rutin Preoperatif Laboratuvar Testlerinin Kullanımı ve Preoperatif Değerlendirmede Öykünün Önemi: Tek Merkez Deneyimi

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ABSTRACT

Objective: To investigate the consequences of routine laboratory tests that lead to surgical delay or high cost in patients with a normal medical history and physical examination who undergo minor surgical interventions.
Patients and Method: Files of 1,322 patients aged between 0-16 years that had undergone elective surgical intervention within six years were reviewed.
Results: Of the 1,322 patients, 1,246 (94.3%) had normal physical examination and laboratory findings. Seventy-six children who had abnormalities in laboratory findings and physical examination were referred to pediatrics. Of the 76 pediatric referees, 42 (55.3%) were reevaluated and were diagnosed with upper respiratory tract infection (*n*=23; 30.2%), iron deficiency anemia (*n*=5; 6.5%), innocent murmur (*n*=4; 5.3%), thalassemia minor (*n*=2; 2.6%), lower respiratory tract infection (*n*=2; 2.6%), urinary tract infection (*n*=1; 1.3%), mumps (*n*=1; 1.3%), acute gastroenteritis (*n*=1; 1.3%), minimal aortic and tricuspid valve insufficiency (*n*=1; 1.3%), minimal aortic stenosis (*n*=1; 1.3%), atrial septal defect (*n*=1; 1.3%). Surgical interventions were delayed until the recovery of the infectious diseases. In 25 of the patients, repeated tests showed normal ranges after the second test; however nine (*n*=9) of the patients showed increased or decreased numbers of white blood cell counts and whose medical history and physical examination revealed signs and symptoms related to infection.
Conclusion: Routine laboratory tests contribute little to preoperative evaluation of children with normal history and physical examination undergoing low grade surgery.

Key Words: Preoperative evaluation, children.

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ÖZET

Amaç: Bu çalışma, öykü ve fizik muayenesinde patolojik özelliği olmayan minör cerrahi uygulanan çocuklarda preoperatif değerlendirme sırasında istenen rutin laboratuvar testlerinin sonuçları ve preoperatif değerlendirmeye katkısını ortaya koymak amacıyla planlanmıştır.
Hastalar ve Yöntem: Elektif koşullarda cerrahi işlem uygulanmış, yaşları 0 ile 16 yaş arasında değişen toplam 1322 çocuğun kayıtları retrospektif incelendi.
Bulgular: Çocukların 1246'sının (% 94.3) fizik muayene ve laboratuvar bulguları normaldi. Fizik muayene ve laboratuvar tetkiklerinde patoloji saptanan 76 çocuğun pediatri polikliniğine danışıldığı görüldü. Bu çocuklar değerlendirildiğinde 42 çocuğun 23'ü (% 30.2) üst solunum yolu enfeksiyonu, beşi (% 6.5) demir eksikliği anemisi, dördü (5.3) masum üfürüm, ikisi (% 2.6) talasemi taşıyıcılığı, ikisi (% 2.6) alt solunum yolu enfeksiyonu, biri (%1.3) idrar yolu enfeksiyonu, biri (%1.3) kabakulak, biri (%1.3) akut gastroenterit, biri (%1.3) minimal aort ve triküspit kapak yetmezliği, biri (%1.3) minimal aort stenozu, biri (%1.3) atrial septal defekt tanısı aldı. Enfeksiyonu olan hastaların ameliyatı enfeksiyon tedavi süresince ertelendi. 25 çocukta ikinci kez tekrarlanan preoperatif testler normal bulundu, ancak 9 öykü ve fizik inceleme bulgularının enfeksiyonla ilişkisi saptanan 9 hastada lökosit sayısı artmış veya azalmış olarak devam etti.
Sonuç: Öykü ve fizik muayenesinde patolojik özelliği olmayan grade 1-2 cerrahi grubu çocuklarda rutin uygulanan laboratuvar testlerinin preoperatif değerlendirmeye çok az katkısı bulunmaktadır.

Anahtar Sözcükler: Preoperatif değerlendirme, çocuk

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INTRODUCTION

Preoperative evaluation should be performed by a pediatrician and/or specialized anesthesiologist before surgery. The objectives of preoperative evaluations are to determine and decrease anesthetic and surgical risk, to admit patients for surgery in the most appropriate conditions to lessen morbidity and mortality, to know baseline functions in order to compare with intraoperative and postoperative ones, to decrease the cost of postoperative care with increased quality, and to help patients return to their normal function in the shortest time and the best possible condition (1-10).

Laboratory test packages vary according to each clinic (1-7). However, limited use, costs and in particular, false positive results lead to repetition of tests that also augment the costs. There is still no consensus about routine preoperative laboratory evaluations, particularly in children with normal medical history and physical examination who undergo minor surgical interventions. Hemoglobin concentration, hematocrit, urine tests, serum electrolyte levels, coagulation tests, electrocardiography (ECG) and postero-anterior chest radiography are routinely ordered for preoperative evaluation in many clinics without any inquiry (1-7).

The aim of this study is to find out the consequences of these routine laboratory tests that lead to surgical delay or high cost in patients with a normal medical history and physical examination who undergo minor surgical interventions.

PATIENTS and METHOD

Files of 1,322 patients that had electively undergone grade 1 (skin biopsy, tooth extraction, simple suture) and grade 2 surgical intervention (gastrointestinal endoscopic evaluation, surgical tooth extraction, adenoidectomy, tonsillectomy, ear drum repair, circumcision) within six years were reviewed. This amount of time was selected as this was the period that the majority of the authors (ST, UK, EDM, HB) had worked in that center. The study was approved by the institutional review board of Kirikkale University School of Medicine (#2011/0065).

Before these elective interventions, complete blood count (CBC), blood chemistry, urinalysis, urine culture, throat culture, hepatitis markers, blood group, PT, aPTT, bleeding time, electrocardiography (ECG), postero-anterior chest radiography used to be routinely ordered for every child by the surgical departments in our center, and referred to pediatrics where eventual evaluation was performed. Medical history and physical examination findings, diagnoses, results of the preoperative laboratory tests and repeated tests performed in pediatrics were recorded. Blood samples were tested by auto-analyzers. Electrocardiography (ECG) (Standard 12 derivations and V4R) were performed with Cardioline Digital Electrocardiograph. A pediatric cardiologist performed echocardiography in children with a heart murmur.

Descriptive statistics were used to analyze the data using the computerized SPSS program version 12.0.

RESULTS

The mean age of the 1,322 patients [793 male (59.9%), 529 female (40.1%)] was 5.7 $\pm$ 2.3 years (5 months - 16 years).

A total of 1,246 children (94.3%) had a normal physical examination and laboratory findings. The rest of the patients (*n*=76; 5.7%) were referred to pediatrics either with complaints (fever, ear pain, sore throat, nasal discharge, cough, diarrhea or vomiting) or pathologic findings from the physical examination (oral aftous lesions, lymphadenopathy, tonsillar-oropharyngeal hyperemia and/or presence of crypts, rales, rhonchi, murmur) or abnormal laboratory findings (low hemoglobin level, thrombocytopenia, leukocytopenia, leukocytosis, increased bilirubin, alkaline phosphatase, alanine aminotransferase [ALT] and aspartate aminotransferase [AST] levels, abnormalities in urinalysis, slightly prolonged prothrombin time [PT] and prolonged activated partial thromboplastin time [aPTT]). In our study, 76 patients with abnormal physical findings and/or laboratory results were referred to pediatrics for a specialist consultation. When leukopenia or leukocytosis, thrombocytopenia, elevated liver function tests, proteinuria and prolonged PT and aPTT were examined again, the results of repeated tests confirmed normal ranges in 25 of the patients (Table 1). Of the remaining nine patients, increased or decreased numbers of white blood cell count or decreased hemoglobin were found. However, medical history and physical examination of these patients revealed signs and symptoms related to infection. Further tests were performed to diagnose iron deficiency anemia, cardiac disease and thalassemia minor. Surgical interventions had been delayed because of these tests. The diagnoses that were determined before surgery had not caused any complications during the postoperative period (Figure 1, Table 1).

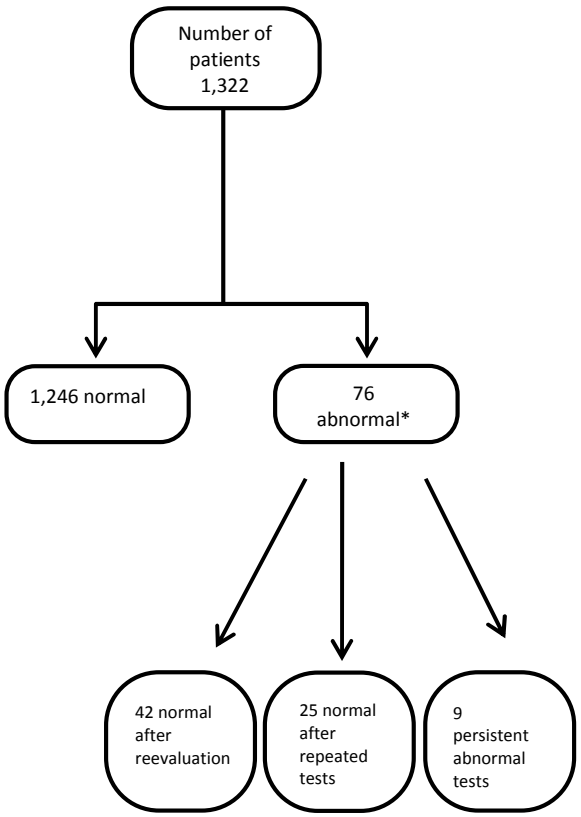

Figure 1. Flow diagram illustrating the patients.
*Abnormal physical examination and/or laboratory results

Table 1: Diagnoses of patients consulted to pediatrics *(n*=76)

Diagnosis	**n***	**%****	**%*****
Upper respiratory tract infection	23	30.3	1.73
Lower respiratory tract infection	2	2.6	0.15
Mumps	1	1.3	0.07
Acute gastroenteritis	5	6.6	0.37
Urinary tract infection	6	7.8	0.45
Cardiac findings****	7	9.2	0.50
Iron deficiency anemia	12	15.7	0.90
Thalassemia minor	2	2.6	0.15
Total	42	55.3	3.20
Laboratory test †	**n ††**	**Abnormalities †††**	
Hemoglobin (gr/dl)	6	10.8 -11	
WBC (x10^3/ml)	10	< 3.5 or > 11	
Number of platelets (x10^3/ml)	1	120	
Urine Analysis	1	Proteinuria (trace)	
AST (U/L)	1	58	
ALT (U/L)	1	61	
Total and direct bilirubin (mg/dl)	1	2.08 /1.1	
Alkaline phosphatase (U/L)	1	821	
Prothrombin Time (sec)	1	14.4	
Activated thromboplastin time (sec)	2	42.8	
Total	25		
Persistently Abnormal Tests			
WBC (x10^3/ml)	7	< 3.5	
WBC (x10^3/ml)	2	> 11	
Hemoglobin (gr/dl)	2	10.8 -11	
Total	9		

* Patients with more than one abnormality, either on physical examination or laboratory
** Percentage of patients according to diagnoses
*** Percentage of patients among the study group
**** Aortic and tricuspid valve insufficiency, aortic stenosis, atrial septal defect, innocent murmur
† Results of repeated tests.
†† Number of all patients who had abnormalities in laboratory tests
††† Results of patients who had been consulted due to abnormalities in laboratory tests

DISCUSSION

Preoperative evaluation is essential in patients who would undergo anesthesia or sedation. However the evaluation should be based on medical history and physical examination findings rather than laboratory tests, particularly in cases of minor surgeries as the usefulness of the routine laboratory tests are uncertain. However most surgeons continue to order them in order to be on the safe side, although routine tests are expensive and rarely change perioperative management. Abnormalities are frequently insignificant or cause delay in admittance to surgery (8-13).

In our study, 76 patients with abnormal physical findings and/or laboratory results were referred to pediatrics. Forty two patients were found to be suitable for minor surgery at the time of referral since diagnoses like iron-deficiency anemia, aortic and tricuspid valve insufficiency, atrial septal defect and thalassemia minor or laboratory abnormalities like trace proteinuria or slightly elevated liver function tests had no effect on the decision of either anesthetic methods or surgery. When leukopenia or leukocytosis, thrombocytopenia, elevated liver function tests and prolonged PT and aPTT were examined again, the results of the repeated tests confirmed normal ranges in 25 patients (Table 2). Of the remaining nine patients, increased numbers of white blood cell count (>11 x 10^3/ml) were found in two of the patients. Both of these patients had cryptic tonsillitis and in one of them, beta-hemolytic streptococci were isolated. Surgery was postponed in these patients until the end of their course of penicillin treatment. Leukopenia (<3.5 x 10^3/ml) was also persistently noticed in seven patients who had been diagnosed with either respiratory tract infections or acute gastroenteritis, probably of viral origin. Although these patients had been treated before they were admitted to surgery, no substantial delay was recorded as the medical history and physical examination of these patients revealed signs and symptoms related to infection. O'Connor et al. (14) retrospectively reviewed the records of 486 elective surgeries in children in order to determine the role of abnormal preoperative laboratory test results in the perioperative management. Only in five children (1%) was surgery actually cancelled due to abnormal laboratory tests: two due to anemia, two to an abnormal urine analysis (UA), and one because of a prolonged partial thromboplastin. Both children with anemia had been treated with iron for a period of two months and subsequently underwent surgery without any complication. Of the abnormal urine analyses, one had been contaminated, and the cancellation of surgery resulted in a complication requiring emergency surgery. The other abnormal UA was a probable asymptomatic bacteriuria, and the infant later underwent surgery uneventfully (14).

The American Academy of Pediatrics disapproves the order of a routine chest X-ray before surgery, since considerable information is rarely possible when there are no positive findings in the patient's history and their physical examination. This approach also saves children from exposure to radiation as well as saving time and money (14). Our findings are also consistent with this.

INAHTA (International Network of Agencies for Health Technology Assessment) synthesis report limits preoperative tests to special age groups which are almost always beyond childhood or conditions deserving particular attention (chest X-ray for patients over 60 years of age, or with a body mass index over 30, or for patients smoking more than 20 cigarettes a day; ECG for patients over 60 years of age, or for those between 40-60 years who had never had an ECG; CBC for newborns, patients over 60 years, fertile women and those who are expected to bleed more than 500ml during the operation; coagulation tests for those who had a history of coagulation problems; and BUN, creatinine and glucose levels for patients over 40) (15). Van Klei at al. suggested that routine preoperative tests for patients below 60 years is not necessary because of its so limited usefulness and that false positive outcomes lead to repetition of tests which produce additional problems (16).

In a retrospective study, the data of 10,656 patients between 15 days and 17 years of age who were admitted to minor surgery were reviewed. The study group was divided into two groups in which group A included 1,884 children who underwent routine preoperative laboratory tests, whereas group B included 8,772 children in whom preoperative, selected laboratory tests were performed only when the child's history and/or clinical examination suggested any abnormalities. Complications in group A were not related to abnormal test results and in children with normal history and physical examination, it seems that costs and anxiety of the family and the child could be reduced if unnecessary preoperative tests are not performed (14-17). In the Mayo Clinic, preoperative tests have not been performed in healthy patients (by history and physical examination) since 1994 (18).

NICE (National Institute for Clinical Excellence) published clinical guidelines for preoperative evaluation in 2004. They suggested that for ASA class 1 and Grade 1-2 surgical groups, chest X-ray, ECG, CBC, coagulation and renal function tests, determination of glucose level, urine analysis for patients aged between 0 and 16 years are not necessary. However, for ASA class 1 and grade 3-4 surgical groups, NICE recommends preoperative chest X-ray, ECG, coagulation tests, however they suggest that CBC, renal function tests, determination of glucose level, urine analysis should be performed by the clinician's decision. If patients are admitted for neurosurgery, preoperative chest X-ray, ECG, measurement of glucose level are not suggested, however renal functions should be examined. On the other hand, if a cardiovascular surgery would be performed, preoperative chest X-ray, ECG, CBC, renal function tests must be evaluated. Nevertheless there is neither a certain opinion nor consensus about performing coagulation tests and urine analysis on these occasions (7).

Routine preoperative tests performed in our clinic were found to cost 200-250TL per patient in 2004. This significant amount should be taken into consideration when ordering preoperative tests in a country with a budget like Turkey. In the United States, for patients with normal history and physical examination, with the precise order of laboratory tests, $100 per patient could be saved. In Turkey, the cost of history and physical examination is 14.5TL and it seems 185.5-235.5TL per patient could be saved if not examined with unnecessary preoperative tests.

Preoperative evaluation of pediatric patients due to undergo surgery is essential. However, the methods that are used for this evaluation should be in reasonable order, consisting of thorough medical history and detailed physical examination before performing laboratory tests. Besides, the laboratory tests should be well-planned and limited according to the risk during surgery. When children are to be monitored for elective surgery, it must be the pediatrician's mission to emphasize the importance and convince the surgeon of the value of precise history taking and physical examination. As most of the abnormalities found in the laboratory are usually independent of planning surgery, laboratory tests should only be performed where deemed clinically necessary, thereby reducing the cost of preoperative evaluation in minor surgeries. We believe that larger studies are warranted in order to assess the routine preoperative tests in the setting of our country's conditions.

Conflict of interest

No conflict of interest was declared by the authors

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