

Use of prophylactic antibiotics in plastic and reconstructive surgery: necessary or not?

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This study was performed on 334 patients whose diagnoses were classified under four groups. During the induction of anesthesia one half of each group preoperatively received two grams of sulbactam-ampicillin and the other half placebo (salin solution) IV and the wound infection rates were observed postoperatively. The age, sex and the site of operation of the patients with the same diagnoses were almost same in each group. All patients were retested in the postoperative period with respect to white blood cell and temperature. The postoperational wounds were observed daily and graded on a predetermined scale (adopted from the Manual on Control of Infection in Surgical Patients, American College of Surgeons). Patients with wound infections have sent specimens for bacteriologic identification. This study was performed to investigate whether the use of prophylactic antibiotics is more effective on postoperative infection rates or not. According to our clinical experience, the use of prophylactic antibiotics in the plastic surgery is not necessary. At the end of our two-years study we established that there was no difference between the use of prophylactic antibiotics and the lack of them. [Turk J Med Res 1995; 13(2): 59-65]

Key Words: Antibiotics, Plastic and reconstructive surgery

The position of prophylactic antibiotics which are used to prevent postoperative infections in plastic and reconstructive surgery is not clear in the literature (1-4). Another contradictory subject is related with the form of use of the prophylactic antibiotics. This subject is related with the form of use of the prophylactic antibiotics. This subject could have not been determined exactly in the literature for other departments, too (5). In surgical attempts in the plastic surgery, the infection risk is very small regardless of the use of prophylactic antibiotics, and very broad series are required in order to determine the more advantageous use (1). There are not enough studies in the plastic surgery related with this subject, hence, we planned and performed this study for a meaningful data.

The medical treatment of bacterial infections by antibiotics has begun with the discovery of the effectiveness of prontosyl, an azu stain, on experimental streptococcus infections in rats, in 1923 by Domagk. In 1937, Trefouel has isolated sulphonamides and in

1939, Florey in Oxford, has isolated penicillum notatum. At that time, with the increase of wrong and needless use of the antibiotics the pathogens, sensitive to these chemotherapeutics, have caused resistant pathogens to appear (6,7). But in contrary, with the improvement in medicine and technology more specific antibiotics have been developed (8,9).

Today, the treatment by antibiotics is rather provided by a specific preparation with regard to sensitive microorganism. Beside this, the prophylactic aimed treatment is also the case. In the early phase of a burn, antibiotics are used for prophylactic aims with the thought that streptococcal invasion could cause an infection (1).

Our aim with this study is to search out the effectiveness of prophylactic antibiotics upon the infection rate in the plastic and reconstructive surgery events in different groups in order to evaluate different comments in the literature objectively.

MATERIALS AND METHODS

Our study has been performed on 334 patients admitted to our clinic between the years 1992-1994. The data were gathered in four basic groups and the patients in all of these groups were chosen from those who have no complaints about immunosuppression,

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diabetes mellitus, rheumatoid heart diseases, cardiac valvular diseases, liver-kidney illnesses and no allergy past. There were 152 female and 182 male patients in total. The average age was 29 (Table 1). A statistical evaluation has been done by taking into account parameters like the patient's preoperative and postoperative leucocytes, morning-evening fever controls, the macroscopic evaluation of the region and the culture results at the end of the study.

The patient groups are as follows:

1st. Group: patients, treated for a reconstruction due congenital abnormality in the head-neck region, trauma or tumor.

2nd. Group: patients, being applied a cosmetic surgery.

3rd. Group: patients, being applied a flap and graft in the body and extremities.

4th. Group: patients, being applied an alloplastic implant (Table 1).

148 patients in the first, 40 in the second, 112 in the third and 34 in the fourth group were included in the study. In each group (for the same event) preoperative intravenous single dose prophylactic antibiotics have been applied to one half, and placebo (serum physiologic) to the other half by the same quantity. The operation was made only after 1-3 days have passed. The sulbactam-ampiciline, that is able to reach the maximum serum concentration (70-90 microgram/ml/hour) in a short time, effective especially upon the soft tissue, and that shows its antibacterial effects by means of inhibiting the mucopeptide biosynthesis in the cell wall of the micro organisms being in the active increase period, has been chosen as a prophylactic antibiotic under the guidance and supplementary of the Hacettepe University, School of Medicine, Chief Department of Infectious Diseases (10-12). During the anesthesia! induction, two grams of intravenous slow pushe has been administered to the adults, and calculating the total dose out of 150 mg/kg

Table 1. Distribution of the patients according to age, sex and treatment groups with their diagnoses and infection rates

1st GROUP			2nd GROUP		
Diagnosis	Patient No	Infected	Diagnosis	Patient No.	Infected
Facial bone fractures	36	4	Rhinoplasty	10	—
Facial bone tumors	6	2	Blepheroptasty	8	—
TMJ* dysfunction	8	1	Face lift	4	—
Congenital anomalies	4	1	Abdominoplasty	6	1
Facial lacerations	20	2	Liposuction	6	—
Radial neck dissection	4	—	Reduction mammoplasty	6	1
Cleft lip and palate	20	1			
Tumor excision and reconstruction	40	3			
Contractures	10	—			
Total	148	14	Total (%)	40	2
Placebo group (%)		9.4	Average age: 35.0 year		5.0
[Average age: 28.7 year]			Average age: 35.5 year		5.0
Sulbactam-Ampicillin group (%)		9.4	Sex:		
[Average age: 29.9 year]			Male	13	
Sex:			Female	27	
Male	86				
Female	62				
3rd GROUP			4th GROUP		
Traumas of upper extremity	36	3	Application of implants to head and neck	16	1
Traumas of lower extremity	26	2	Application of implants to body and extremity	18	2
Congenital defects of hand	10	—			
Hypospadias, Epispadias	10	—			
Pressure sores	20	2			
Tumor excision and reconstruction	10	—			
Total	112	7	Total (%)	34	3
Placebo group (%)		7.1	Average age: 29.8 year		5.8
[Average age: 28.6 year]			Average age: 31.7 year		11.7
Sulbactam-Ampicillin group (%)		5.3	Sex:		
[Average age: 27.6 year]			Male	15	
Sex:			Female	19	
Male	68				
Female	44				

*TMJ: Temporomandibular joint

for babies, up to ten kilograms intravenous slow pushe has been administered to babies by the same way. The operations have been performed by the same team and the duration of the same events were tried to be kept at the same point as much as possible. The patients whose duration was prolonged or patients who have half-finished operation duo any problem were all excluded from the study.

After the operational area hygiene of the patients in each group was made by 7.5% polyvinylpyrrolidon-iodine complex, and the dirty wounds cleaned with extra serum physiologic, the operation started following the debridement. The first postoperative dressing was made at latest after 12 hours. The dressings were made the same way in all patients by cleaning the incision lines with serum physiologic and 10% polyvinylpyrrolidon-iodine complex. In intraoral interferences, the patients were to gargle the same solution at least six times a day. The drains in patients with a penrose drain were withdrawn after 24 hours. Patients with a negative pressure drain (hemovac) got a hemorrhagic fluid serose and the fluid that accumulated in 24 hours was held until its quantity declined to 20 cc.

The incision regions of the patients were evaluated macroscopically with a predetermined 5 degreeed infection schedule (13,14) (Table 2). According to this schedule, cases dependent on the lymphatic drainage of the area were accepted to be normal in the 1st, 2nd and 3rd degrees. The 4th and 5th degrees were accepted to be postoperative infections. After taking and planting cultures with a ekouvional tube, the pathogens were isolated according to their colonial and biochemical properties. Daily fever measures, and the leucocyte amounts following the third day were determined as infection supporting clinical and laboratory investigations in postoperative patients. After it was reported in a study that an infection was noticed in the 11th day with prophylactic antibiotics and in the 5th day with placebo, we pursued our events for 11-12 days (2).

Statistical Analysis

The study, the results were evaluated in terms of age, sex, preoperative and postoperative leucocyte amount, morning-evening fever measure, macroscopic observation of the region and the wound-culture results of the

Table 2. Macroscopic infection schedule (Manual on Control of Infection in Surgical Patients, American College of Surgeons), (13,14)

Grade 1	Erythema around the suture line limited to 1 cm
Grade 2	1 cm to 5 cm erythema
Grade 3	Greater than 5 cm erythema and induration
Grade 4	Purulent drainage either spontaneously or by incision and drainage
Grade 5	Fistulae

patient. In order to understand whether there were any differences between male and female events, the chi-square test was used. The differences between the averages of age, fever and infection degree scores among the four groups and among the prophylactic antibiotics, placebo subgroups were examined with a bilateral variance analysis. The homogenousness of the group variances was tested by the Bartlett-box test, and the differences of the preoperative and postoperative leucocyte averages among the four groups and among the prophylactic antibiotics-placebo subgroups were examined by a repetitive measurements variance analysis.

RESULTS

Among the 334 patients that were summed under four main groups, we treated one half of the patients in each group with placebo, the other half with 2 gr of intravenous pushe ampicillin-sulbactam and established in the results of our study, performed within our parameters, an infection in 7 out of 74 (9.4%) placebo given patients in the first group; in 1 out of 20 (5.0%) placebo given patients and in 1 out of 20 (5.0%) prophylactic antibiotics given patients in the second group; in 4 out of 56 (7.1%) placebo given patients and in 3 out of 56 (5.3%) prophylactic antibiotics given patients in the third group; in 1 out of 17 (5.8%) placebo given patients and in 2 out of 17 (11.7%) prophylactic antibiotics given patients in the fourth group (Table 1).

In all of the four groups, there was no difference between the prophylactic antibiotic-placebo groups with respect to sex ($P>0.05$). There was no difference both among the 4 groups and between the prophylactic antibiotics-placebo groups with respect to the averages of age, the postoperative WBC and the degree of fever and infection ($P>0.05$). The preoperative WBC average in the 3rd group was higher than that in the other groups but the average was not significant. In all of the groups, the postoperative WBC average was higher than the preoperative WBC average but none of their increases was as great as that in the infected events. As a result, in all four groups, the difference between the number of patients who were given placebo infection emerged and the number of patients given prophylactic antibiotics infection emerged, was statistically not significant ($P>0.05$).

In the third day of our patients who were subjected to an infection, a 4th and 5th degree according to the infection schedule has been established in the macroscopic evaluation besides a leucocyte increase. The fever of each patient was high in the postoperative 1st day, but normal in the 2nd day. In patients with an infection rise, the fever got again high in the 3rd day (Table 3).

In the bacteriological examination of our patients with an already emerged infection, the following

Table 3. Distribution of infections in the groups

Diagnosis	Treatment	Preop. WBC	Postop. WBC	Fever C	Culture	Inf. degre.
1st GROUP						
Sulbactam-Ampicillin						
Mandibule symfisis fracture	Compres. plate fixation	5400	10200	39	<i>Stap.aureus</i>	5
Mandibule parasym. fracture	Osteosynth and comp. plate fixation	5000	10400	39	a-Hemo.strep.	4
Maxillar defect (Bone tumor)	Osteofaciocutan flap	4000	11000	39	<i>Strep.pneumonia</i>	5
TMJ* disfunction	Eminectomy	4000	10300	38.5	—	4
Hairy cell nevus	Flap surgery	4000	10000	38.5	<i>Stap.aureus</i>	4
SCALP laseration	Local flap surgery	5100	12000	39.5	<i>Stap.epidermidis</i>	4
Lower lip defect	Flap surgery	6000	11000	38.5	<i>Stap.epidermidis</i>	4
Placebo						
Mandibular defect (Tumor)	Pectoralis osteomyocut.f.	6000	11000	39	<i>Stap.aureus</i>	5
Non-union mandibular fracture	Iliac bone graft+osteosent.	5000	11200	39.5	<i>Stap.aureus</i>	5
Multiple mandibular fracture	Plate&wire fixation	6000	12000	39	<i>Stap.aureus</i>	4
SCALP&auricular laseration	Local flap surgery	6000	14000	39	<i>Pseudomonas aeruginosa</i>	4
Congenital cleft lip	Repair	4500	10100	39	<i>Stap.aureus</i>	4
Torticollis	Repair	5000	10000	38.5	<i>Stap.epidermidis</i>	4
Tumor on nasal dorsum	Bilateral nasolabial flap	4600	12100	38.6	<i>Stap.aureus</i>	4
2nd GROUP						
Sulbactam-Ampicillin						
Gynocomasty	Reduction mammoplasty	5000	12400	39	<i>Stap.aureus</i>	4
Placebo						
Abdominal lipodistrophy	Abdominoplasty	5000	14300	39	<i>Stap.aureus</i>	4
3rd GROUP						
Sulbactam-Ampicillin						
Wide laseration on thigh	Repair with local flap and graft	6000	18600	39	<i>Stap.aureus</i>	4
Sacral pressure sore (grade 4)	Repair with local flap	6000	14000	39.5	—	4
Flexor tendon laseration (No man's land)	Reconstruction with tendon graft	6300	10500	38.5	—	4
Placebo						
Defect on arm	Parascapular flap (free)	6200	12000	39	<i>Stap.aureus</i>	4
Flexor tendon laseration (No man's land)	Reconstruction with tendon graft	5000	11150	38.6	<i>Stap.aureus</i>	4
Trokanteric pressure sore (gr.4)	Repair with local flap	5000	12600	39	—	4
Anterior tibial defect	Repair with local flap	6000	9800	38.5	—	4
4th GROUP						
Sulbactam-Ampicillin						
Palm contracture	1st stage, expander app.	4000.	10400	39	<i>Pseudomonas aeroginosa</i>	4
Extansor tendon defect	Application of hunter spacer	5000	12400	38.3	—	4
Placebo						
Alopesia	Tissue expander	4500	12200	39.5	<i>Pseudomonas aeroginosa</i>	4

*TMJ: Temporomandibular joint

pathogens were not established: *staphylococcus aureus* 46% in rate, *staphylococcus epidermidis* 11.5% in rate, *pseudomonas aeroginosa* 11.5% in rate, *strep-tococcus pneumonia* 3.8% in rate, a-hemolytic streptococcus 3.8% in rate and any pathogen in the rate of 23% (Table 4).

A drainage and local antibiotics administration has been made in the medical treatment of our patients with emerged infections, and in some events,

after the infection passed, the patient was again taken to operation whereon the medical treatment of the complication was made.

DISCUSSION

An infection risk emerges when the surgeon makes an incision on protective areas like the skin and the mucous membrane. Despite the sterilized surgical equipment, dressing, operation room and the antisept-

Table 4. Isolated micro organisms. P.A: Prophylactic antibiotic, P: Placebo

Pathogen	1st GROUP		2nd GROUP		3rd GROUP		4th GROUP		Total	%
	p.A	P.	P.A	P	P.A	P	P.A	P		
<i>Staphylococcus Aureus</i>	2	2	1	2	2	3	—	—	12	46
<i>α-Hemolitik Streptococcus</i>	1	—	—	—	—	—	—	—	1	3.8
<i>Streptococcus Pneumonia</i>	1	—	—	—	—	—	—	—	1	3.8
<i>Staphylococcus Epidermidis</i>	—	—	2	1	—	—	—	—	3	11.5
<i>Pseudomonas Aeroginoza</i>	—	—	—	1	—	—	1	1	3	11.5
Unknown microorganisms	—	1	—	—	2	2	1	—	6	23

P.A: Prophylactic Antibiotic

P.: Placebo

thic solutions, a postoperative infection that emerges is the greatest complication no matter how well and successful! the operation was performed in the sense of technique and early results. In the literature, up to now, a 0% postoperative infection has never been remarked. Due cases like local variations, different resistance mechanisms of the persons, surgical equipment in use etc., infections come about in a definite rate. Within those different approaches, it is asserted by some authors that the risk of postoperative infections in operations performed in more than 4 hours is increasing (15). In our clinic, three patients were given sulbactam-ampicillin and four were given placebo in the 3rd group, hence, from the seven free tissue transfers that we performed, an infection emerged in only one patient (Table 3). These patients were held six hours in average under operation. Some authors have declared that, since the infection risk in intraoral attempts is high, the administration of a prophylactic antibiotic would be very useful (2). They lowered the rate of postoperative infection to 44% by applying preoperative single dose parenteral clindamisin in their studies. However, in our clinical work, in the first group patients who were given prophylactic aimed sulbactam-ampicillin in our intraoral treatment, and in patents given placebo in the same group, a postoperative infection emerged in an equal rate (9.4%). There is no statistical differenc ewithin the group ($p>0.05$). Directly trying the exclusion of reasons, in a systemic way that is, trying to avoid the deprivation of the intraoral hygiene is better than searching for the reason that may cause an infection (1,15,16,17).

The protecting mechanism of the body in cancerous patients is decreasing either with the effect of immunosuppressives or the actual defects in the immune system. The postoperative infection risk in such patients has been established to be very high (11,12,13,18,19). In these studies it was found that compared with placebo a smaller infection emerges in the surgical therapy of head and neck cancers, alone with klindamisine or gentamisine in combine prophylaxis (13,20), but on the other hand, in patients with head and neck cancer where only a radical neck dissection was made, a statistically significant difference could not be determined (14). According to these

writers, in the major head and neck cancer surgery, if turned from the skin to the aerodigestive canal, the rate of the postoperative infection increases, which can be lowered with prophylactic antibiotics. However, the rate of infection observed in our 1st group patients being applied a mandibula tumor excision and reconstruction in our clinic, was found to agree with the literature. No difference was observed between the patients given placebo and prophylactic antibiotics. It was reported in a different study, that with the use of prophylactic antibiotics in nasal surgery, the other resistans pathogens, when activated, increase the postoperative infection rate (17). The prophylactic antibiotics in intraoral interferences in another study were used with the aim to remove the effect of bacteriemin that may develop postoperatively in pathologies (heart prothesis, liver-kidney diseases, patients having metabolic diseases, immunosuppressive patients) present in other systems (16). In such patients, antibiotics are not used for the success of the therapy but to avoid the patient's mortality (17,21,22). These patients in our clinic were operated under prophylaxy with all the necessary consultations and were excluded from the study.

Another contradictory subject is related with the form of use of prophylactic antibiotics. This subject could have not been determined exactly in the literature. In some reports, one preparation (10,15,19,3) and in some others a combined therapy is suggested (11,13,23). While some authorities suggest a long lasting prophylactic antibiotic therapy (11,12,21,23) others have asserted that a single dose does not differ from the long lasting use (2,20,24). Even another author stated that a prophylactic antibiotic, given orally two hours before, will be more effective than a parenteral treatment (25). Among all these point of views, another one stated as an interesting working subjects, that with the use of prophylactic antibiotics, the time the patient stays in hospital will be shortened and so the patient would save his money (26).

While it is mentioned in a study of neurosurgery that in skull bone fractures, the prophylactic antibiotic has no gain (27), in another work in elective cases, the difference was found to be significant in the favour

of prophylactic antibiotics (28). According to our study, no infection has emerged in the edonor regions of the 3 patients given prophylactic antibiotics and the donor patients given placebo.

In the intra abdominal interferences, there are different thoughts about the use of the prophylactic antibiotics in the literature. While some authors assert that in intra abdominal interferences the administration of prophylactic antibiotics and even the drain is needless (29,30), others strongly state that in interferences of this kind, the dose of the prophylactic antibiotic should be above the normal dose level (31,32).

One third of the plastic surgeons in USA, which apply flap and graft, use a routine prophylactic antibiotic (4). Whereas, the use of antibiotics is meaningless in cases where the infection risk is of no importance. Besides, the deprivation of the patient's ecological balance, and the turn of heterotrophe non-pathogenous organism into potential pathogens will cause a damage rather than a gain (4,5,23,30,33-36).

In short, the antibiotal treatment in its very real meaning should be made after the balance between man's natural resistance mechanism and the micro organisms is deprived. With the use of prophylactic antibiotics in some elective surgery, the presence of this balance is endangered. In any case, in such surgical attempts, the infection risk is very small regardless of the use of prophylactic antibiotics. Although many studies are published, the point that in elective surgery or in acute cases antibiotics should be used to solve the infection problem, is still being in discussion (1).

At the end of our two-years study, we established that in plastic and reconstructive surgery, prophylactic antibiotics are unnecessary or it will be appropriate to use them, after their necessary consultations, only in the very risky group (immunosuppressive patients, or patients having metabolic diseases).

Plastik ve rekonstrüktif cerrahi girişimlerde sistemik profilaktik antibiyotiğin kullanımı: gerekli mi, gereksiz mi?

Çalışmamız kliniğimizde iki yıl içinde, tanılarına göre dört ana grup altında toplanmış, operasyon için engel teşkil etmeyen toplam 334 hastada yapılmıştır. Grup içinde profilaktik amaçlı anestezi induksiyonu sırasında hastaların yarısına plasebo diğer yarısına ise intravenöz tek doz sulbaktam-ampisilin verilerek Plastik ve Rekonstrüktif Cerrahi ile ilgili girişimlerde profilaktik antibiyotiğin postoperatif gelişebilecek enfeksiyona etkisi araştırılmıştır. Her grup içinde hastaların yaşı, cinsiyeti ve operasyon bölgesinin lokalizasyonu mümkün olduğunca benzer tutulmaya çalışılmıştır. Operasyonlar aynı ekipler tarafından gerçekleştirilmiştir. Operasyon süresi herhangi bir problem yüzünden uzayan veya diğer sistemik enfeksiyon sebebi ile

antibiyotik kullanılan hastalar çalışma dışı bırakılmıştır. Postoperatif hastalarda günlük ateş, 3.günde lökosit tayini yapılmış olup, hastalar 7 gün süre ile takip edilmiştir. Enfeksiyon gelişen hastalarda Eküvyonlu tüpe kültür alınıp patojen koloni ve biyokimyasal yöntemle izole edilmiştir. Çalışma sonunda grupların kendi içinde anlamlı fark bulunmamıştır ($P>0.05$). Gruplar arasında enfeksiyon oranı intraoral yaklaşılan ve implant yerleştirilen 1. ve 4. grupta diğer gruplara göre daha yüksek bulunmuştur. Literatürdeki çalışmalarda farklı sonuç ve yorumların yarattığı kargaşa sonucu, kliniğimizde iki yıl süreyle yaptığımız bu çalışma sonucunda profilaktik antibiyotik verilen ve verilmeyen hastalarda, postoperatif enfeksiyon oranında istatistiksel olarak anlamlı fark bulunmamıştır. [Turk J Med Res 1995; 13(2): 59-65]

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