

# THE ROLE OF THE ANTIBIOTICS IN THE WOUNDS' INFECTION

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## Abstract

Surgical infection is called "*an infection which is the result of the surgical action or the result of the hospitalization if the surgery ward*". Although health systems vary in different countries, they fall into common denominator, that the presence of the surgical infection increases the cost of surgical service. The presence of the surgical infection is not also the cause of morbidity increasing but also the mortality increasing. The purpose of this study is: *the evaluation of the antibiotics role above the infection surgical site.*

The concept of the *surgical site infection* in itself means infections which touch and develop in the site, where the surgical intervention is performed and are divided into:

- a. Infections of operating wound
- b. Intracavitary and organ infections

The role of the antibiotics used for antibioprophylax (ABP). The role of the antibiotics used for antibiotherapy (ABT) in the wound infection.

**Methods:** In this study taken into consideration the operations carried out during the period of 1 September 2005 up to 31 March 2006 for strumectomi, Cholecystectomi and hernia Plastics of all types in totality-242 interventions. All these operations are carried out in the planning surgical wards at Regional Hospital of Shkoder which are controlled 3 times by the Hygiene and Epidemiological Department, in order to see their state of cleanness and hasn't resulted that there is an increase of germs. The antibiotic used in this study Cefasolin

which is administered by an iv dose of 2 grams in the period of anesthesia induction, or divided into 2 doses as antibioprophylax (ABP).

**Results:** During the time of this study are operated in totality 24 cases with *Struma*. From these, antibiotherapy (ABT) is not used in any case, antibioprophylax (ABP) is used only in one case for two days, ABP with two doses is used in two cases. ABP with only one dose was used in 12 cases and there were no antibiotics used in 9 cases. There was no wound infection in the group of intervention for colecystit were included in totality 82 cases divided into 51 cases with a wound probable contaminated and 31 cases with contaminated wounds. In the wound probably contaminated was used antibioprophylax (ABP) with a dose in 24 cases, ABP with 2 doses in 19 cases and antibiotherapy (ABT) in 8 cases. There was no wound infection. In the group with contaminated wounds ABT was used in 26 cases and ABP with two days in 5 cases. There were shown up three wound infections (two superficial wound infections and one deep infection). In the group of interventions for hernia (in totality 136 cases) in 40 cases was not used a Prolen nets while in 96 cases was used Prolen nets. From 40 cases without nets in three patients was used a dose ABP, whereas in 37 other cases was not used ABP at all.

In all these case there was no wound infections. In patients with hernia with Prolen (96 cases) was used ABP with one dose (48 cases), ABP with two doses (38 cases), with ABP in two days (1 case) and ABT (9 cases) where were noticed 4 infections.

**Conclusions:** The kinds of operations taken in the ABT and ABP study have the same value in reducing of surgical infections.- In the clean wound the use of ABP with one dose has the same value with prolonged ABP.- At Struma and herniary plastic without heteroplastic, is possible not to use antibiotics.- Cefasolina 2.0 iv administered in the induction phase is the most appropriate dose in the medical action aspect as well as in terms of cost effectiveness.

### Introduction

The surgical infection is included in the category of nosocomial infections as "infections that take place within the hospital or by pathogens that are obtained during hospitalization". Surgical infection in itself is described as "an infection that is a result of surgical act or the result of the hospitalization in the surgical ward".

Epidemiological studies of surgical infection have a great value in many directions especially the increase of morbidity, mortality, the increase of the cost effectiveness for their treatment. According to the literature data's referring to the doctor A. Gjates's in U.S.A that deaths from these infections make up one of the ten causes of deaths in U.S.A (about 40% of them are surgical infections). They are responsible for 44000-98000 deaths per year and an annual cost of about 17-19 billion dollars. Again according to the data's of this monograph referred to "Mother Teresa" university center from surveys done in the general surgical service, figures of operating wound infection go from 37,8% in 1992, to 15,07% for the year 1996 and 9% for the year 2002 (1).

The surgical site infection is a faithful translation of the nomination decided by CDC (Center for Disease Control and prevention) (3) and in fact we will treat it as the operating wound infection. For this reason are formulated the guide-lines for the treatment of SSI which are changed and completed over the years (2). To be treated like these treatments should not be appeared in 48 hours before hospitalization of the patient in the surgical ward. Also in this group are inserted even those wound infections in organ intervention or Intracavitary discovered after

coming out of the hospital. Here should not be involved those inflammatory reactions of organism towards the not infected agents.

Antibioprophylax (ABP) Is the administration of the antibiotics or antimicrobials of the patients who don't present data's on infection installed with the aim of reduction of the risk for post operating with infections nature.

Antibioterapy (ABT) we mean the use of the antibacterial for the treatment for the installed infections. It must be said that antibiotherapy is used in all the cases of infections treatment requiring surgical intervention except of some small obsessions which are drained but don't need ABT. In these cases the most important moment is the surgical intervention.

### Materials and Methods

In this study were taken into consideration the intervention performed during the period of 1 September 2005 to 31 March 2006 Strumectomy, Cholecystectomy and plastics for inguinal hernia, umbilical, incision-totally 242. These operations are carried out in planned surgical wards. The pursuit of the patients was done in a period over a month, whereas in cases where it is used with hernia considered ongoing study for a year. Also, it is done a three times control by the Hygiene and Epidemiological Department to see the conditions of the operating rooms. For the taken plantings was not resulted an increase of germs. It is taken the antibiograma in most cases in suspicion for infection (serose or sero- semantics leaking) and all confirmed cases of infection are equipped with antibiograms. Infection were evaluated in virtue of the criterion of CDC.

In our study we have used (in all cases) in all cases Cefasoline I.V antibiotics with a wide spectrum of action with a mechanism of action inhibiting the synthesis of the cellular wall of microorganisms, which reaches the proper concentration at the time when the incision initiated in accordance with 'timing'- un tone. Referring to the values in our pharmaceutical marked we think that the use of Cefasoline is an effective cost in its using. The dose used as ABP of Cefasoline has been 2 grams i.v. another important element has

been even the choice of antibiotic infection time (timing). In accordance with the chosen characteristics of antibiotic we have chosen as the times of application the induction phase in anesthesia. More precisely it is just opened the veno way, where it is immediately applied the antibiotics in 2 gram doses and then is performed the spinal or general anesthesia.

### Results

Operations for Struma are considered as clean operation therefore the study is focused only in ABP. From 24 cases taken in this study in no case was used antibiotherapy (ABT 0 case) antibiotics were not used at all in 9 cases, it was used ABP with two days. In all cases treated was not found any infection. The percentage of infection the use of AB in the Struma cleaned wounds.

**Table nr.1**

Operation Type (Struma)	No. of cases	%	Infection	% of infection
Without AB	9	37.5	0	0
ABP with 1 dose	12	50.0	0	0
ABP with 2 dose	2	8.3	0	0
ABP with 2 days	1	4.2	0	0
ABT	0	0	0	0
<b>TOTAL</b>	<b>24</b>	<b>100.0</b>	<b>0</b>	<b>0</b>

### At cholecista

During the period under study was operated a total of 82 patients. In all cases is carried out cholecystectomy. There is no case with calculus of choledoc or associated with its openness. For the effect of study the number of patients was divided into two groups with probably contaminated wounds (chronic Colecystit) and contaminated wounds (acute colecystit). For treatment with ABT or ABP was decided during the intervention. In any case it is applied a prophylactic dose Cefasoline 2 gram iv. as we said above all the wounds of the second group (contaminated) were treated with antibiotherapy. In this group we have 5 patients who were treated only 2 days (as ABP). Also in the first group with clean wounds we have 8 patients treated with ABT this for the custom's force or refracted position of the surgeon towards this study. This spirit was especially observed at the beginning of this study. Here it is necessary to clarify that at the beginning of this study had certain timidity or uncertainly in relation to the patient. This happened because we

'were used to load the patient with antibiotic with the idea of being inside or to be sure'. But when we started to do the working out of the first data's, we began to change our mentality and at the end of the study we were convinced that the use of the antibiotics without criteria didn't favor in relation to the wound infection.

The obtained results in the study are as follows:

### For the cases probably contaminated: 51 cases were operated

Without AB	0
with a dose	24
with 2 doses	19
ABT	8

### For the contaminated cases: 31 cases were operated

Without antibiotics	0
With a dose	0
With 2 doses	0
With 2 days	5
With antibiotics	26 cases

In the contaminated wounds were observed: 3 infections (2 superficial + 1 deep infection), 5 hematoma (which are not infected).

The percentage of the infection according to the use of AB in the wound probably contaminated and contaminated in colecystitis.

Table nr.2

Operation for colecystitis	Probably contaminated	Infection No.	% of infection	Contaminated	Infection No.	% of infection
Without AB	0 (0)	0	0	0 (0)	0	0
With 1 dose	24 (47)	0	0	0 (0)	0	0
With 2 doses	19 (37,3)	0	0	0 (0)	0	0
With 2 days	0 (0)	0	0	5 (16)	0	0
ABT	8 (15,7)	1	12,5	26 (84)	2	7,6
Total	51 (100)	1	1,9	31 (100)	2	6,4

Through logistical regression it is seen the binary that it is a connection between antibiotic - therapy and the presence of infection, OR = 1,097, CI 95% [0,988-1,218], p=0,036 (patients treated with ABP don't make infection).

#### In Hernia

In the period included in the study were operated a total of 136 patients with hernia. In this group was important the protection with the antibiotics or not to that group of

patients for who during the operation was used heteroplastic. The use of Prolen increases the degree of the risk for wound infection whereas herniorafia as an operation in itself is placed in clean operations. Thus, hernia group with heteroplastic was not treated with antibiotics or a small number (3 cases) were treated with 1 dose of prophylactic. From the plastic carried out with Prolen was used ABP with 1 dose, with 2 doses and ABT according to the following table:

<b>Without Prolen: 40 cases</b>	
without antibiotics	37 cases
With 1 dose	3 cases
With 2 doses	0 cases
With antibiotics	0 cases
<b>With Prolen: 96 cases</b>	
without antibiotics	0 cases
With 1 dose	48 cases
With 2 doses	38 cases
With 2 days	1 case
With antibiotics	9 cases

**Table nr. 3. Here is the percentage of infections according to the use of AB in the cleaned wounds for hernia**

For hernia operations	Without networks	Infection no.	% of the infection	With networks	Infection no.	% of the infection
Without AB	37 (92,5)	0	0	0 (0)	0	0
With 1 dose	3 (7,5)	0	0	48 (50)	0	0
With 2 doses	0 (0)	0	0	38 (39,6)	2	5,2
With 2 days	0 (0)	0	0	1 (1)	0	0
With AB	0 (0)	0	0	9 (9,4)	2	22,2
TOTAL	40 (100)	0	0	96 (100)	4	4,1

Through the Hi-square test it is shown that there is statistically significant difference between the presence of the infection and antibiotic therapy of ABP, (Hi-square=9.593, df=3, p=0.022), (patients treated with ABP make the infection with a less small percentage).

From the observation resulted 4 infections:

1. With E.Coli
2. with golden Staphylococci
3. Proteus
4. Negative Culture

In the Hernia there were placed subcutaneous Drens in 15 cases. To the 4 infections are with subcutaneous dren.

**Table nr.4. Connections type of operation – infection**

Kind of operation	No.	Infection	% of the infection
Acute colecystit	31	2	6,4
Chronic colecystit	51	1	1,9
Struma	24	0	0
Hernia	136	4	2,9
Total	242	7	2,8

**Table nr. 5. The percentage of the infection depending on the use of the AB for all cases in the study**

Kind of operation	Manner of the treatment	No. of patients	Infection	% of infection
Chronic colecystit	ABT	8	1	12,5
	ABP	43	0	0
Acute colecystit	ABT	26	2	7,6
	ABP	5	0	0
Hernia	ABT	9	2	22,2
	ABP	90	2	2,2
Struma	ABT	0	0	0
	ABP	15	0	0
Total	ABT	43	5	11,6
	ABP	153	2	1,3

Through the Hi-square test it is shown that there is a statistically significant difference between the presence of the

infection with antibiotic therapy and ABP (Hi-square=16,593, df=1, p=0.012), (patients treated with ABP make the infection in a less small percentage).

**Table nr. 6 The results of the wound percentage infection according to the wound category for all cases under study**

Wound category	No. of cases	No. of infections	Incidence %
Pure	160	4	2,5
Probably contaminated	51	1	1,9
Contaminated	31	2	6,4
Total	242	7	2,8

Through the Hi-square test it is shown that there is a statistically significant difference between the presence of the infection and the

type of the wound, in favor of the contaminated wounds, (hi-square = 11,593 df= 2 p= 0.018).

**Table nr. 7 Percentage of the infection in the clean wounds by the use of AB**

AB usage	No. of cases	No. of infections	Incidence (%)
Without AB	46	0	0
With 1 dose	63	0	0
ABP	42	2	4,7
ABT	9	2	22,2

Through Hi-square test it is shown that there is a statistically significant difference between the presence of the infection and ABP

and ABT in favor of ABT (Hi-square=7,797, df=2, p=0.032), patients with ABT make a percentage with a bigger infection.

**Table nr. 8. Percentage of the infection in the contaminated wounds probably by the use of AB**

Use of AB	No. of cases	No. of infections	Incidence %
ABP	43	0	0
ABT	8	1	12,5

Through Hi-square test it is shown that there is a statistically significant difference between the presence of the infection with

antibiotic therapy and ABP (Hi-square=4,760, df=1, p=0.029), (patients treated with ABP do not make infection).

**Table nr. 9. Percentage of the infection in clean wounds and probably contaminated by the use of AB**

AB use	No. of cases	No. of infections	Incidence (%)
Without AB	46	0	0
ABP	148	2	1,3
ABT	17	3	17,6

Through the Hi-square test it is shown that there is a statistically significant difference between the presence of the infection with antibiotic therapy and ABP, (Hi-square=6,409, df=1, p=0.011), (patients treated with ABP make infection in a less small percentage).

#### Causes of the infection are:

E. Coli	3 cases
Golden Staphylococcus	1 case
Proteus	1 case
Unidentified	2 cases

Making an attempt to show a comparison with the given results in our literature and the foreign one we are giving the table below:

**Table nr. 10**

Type of wound	Shkodra 2006	QSUT 2002*	Foreign **
Pure	2.5	2.22	2.27
Probably contaminated	1.9	4.66	9.17
Contaminated	6.4	43.75	19.14
Total	2.8	7.56	8.25

\*The data referred to A. Gjates' monograph

\*\*The data referred to Inigo JJ. In the Navarra's Hospital.

**Table nr. 11**

Kind of operation	Shkoder 2006		QSUT 2002*		FOREIGN**	
	No. of cases	Incidence %	No. of cases	Incidence %	No. of cases	Incidence %
Struma	24	0	46	0	1050	0
Hernia	136	5.44	62	6.2	1297**	3.08**
Colecistite	82	2.46	112	6.25	1435	5***

\*\*The data referred to Sanches Manuel in Castillas Hospital in Spain.

\*\*\*The data's according to Targarona in Barcelona's Hospital.

### Discussion

The introduction of the new concepts in prevention and treatment of surgical infection, use of antibiotics or other antimicrobial about this problem constitutes in challenge to be implemented in every surgical ward. Surely it is not easy and for some reasons among which:

- Force of custom or conservatism of surgeons for the treatment of wound. There are many cases where the antibiotic is used without the proper motivation, but starting to use it 'as to be within'.

Ni this case antibiotherapy is seen as a lifeboat forgetting that however good to be, it doesn't substitute the rigorous execution of the surgical technique.

- Pressure of the family is one of the reasons of using antibiotics without criteria. At the time of the transition that we spend we often run into this phenomenon.

- Lack of a protocol or the guideline for the use of antibioprophylax for operator wounds. For this affect the reduced number of studies carried out in clinics in the country.

Practically even in our study we run into with such phenomenon. Referring to the studied pathology we ran into with a suspicious spirit or "fear" as far as non-usage of the antibiotics is concerned. Nevertheless quickly were seen the first results and all without exception were included in this study.

Interventions for Struma, operator wounds take part in the category of the clean wounds, so we gave up from antibiotherapy and though only for prophylaxis. In 9 cases were not used AB. The other part was 12 cases treated with antibioprophylax. And the result was the same- there was no case of wound infection.

Similar results were achieved even in the wounds of the interventions of hernia without using heteroplastic. In this case 37 of cases (92,5%) weren't treated with the antibiotics and in the end there were no wound infections. In interventions for hernia were Prolen net is used, ABP and ABT was used into a small number of 9 cases. In fact from our results we see that we have an equal number of infections not only with ABT but also with ABT. Even in cases with ABP both of the infections are in patients where 2 doses are used. We think that here other risky factors as Diabetes 2 cases have affected pronounced anemia 1 case etc.

Regarding interventions in colecystit these wounds are considered at the best case as wounds probably contaminated. So it is reasonable to discuss for ABP and ABT. In all cases the patients were initially treated with a dose of AB. We finally noticed that the three wound infections had occurred in operations where the patient had been 'covered' with antibiotics. Even in these cases we think that in operatory wound infections have affected other risky factors namely – the fact that colecists have been in an advanced infections condition 2 cases with contaminated wounds.

### Conclusion

- In types of operations in the study of ABT and ABP have the same value in reducing surgical infection.
- In cleaned wounds the use of ABP with one dose has the same value with a prolonged ABP.
- In Struma and hernia plastics without heteroplastic it is possible not to use antibiotics.
- Cefasoline 2,0 iv administered in the induction phase is the proper dose as in medical terms as well as in terms of cost – effectiveness.

### Recommend

- In cleaned operations we may use only one dose of antibiotic as ABP.
- In operations probably contaminated we can only use ABP.
- The proper dose of the antibiotics is the Cefasoline 2 grams iv.
- The time of the antibiotic administration is in the induction phase of the anesthesia (just the venous way to be opened).

### REFERENCES

1. Gjata A. Surgery Infection. Monograph. 2005.
2. Guideline for the Prevention of Surgical Site Infection, 1999 [PDF - 270 KB.
3. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. CDC definitions of nosocomial Surgical site infections 1992: a modification of CDC Definitions of Surgical Wound infections. Infect Control Hosp Epidemiol 1992; 13:606-8.
4. <http://www.cdc.gov/HAI/ssi/ssi.html>.