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# POST OPERATIVE WOUND INFECTION



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**Title: POST OPERATIVE WOUND INFECTION**

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**Abstracts:**

**Objective:**

Post Operative Wound Infection remains significant causes of post operative morbidity. This prospective study was under taken to establish that whether the endogenous organisms lodged in tissue are the cause of POWI.

**Method:**

Patient undergoing surgery in General Surgery Unit II, Bir Hospital were studied for a period of 12 months and they were prospectively followed up till the stitches were removed for the development of wound infection.

**Result:**

A total of 227 of 325 were followed up till the removal of the stitches. The overall incidence of wound infection was 7.92%. Factor that was found to be significantly associated with POWI was the endogenous organism lodged in the tissue during the surgical procedure. Use of povidon iodine has reduced the bacterial positivity in the Skin and subcutaneous tissue significantly.

**Conclusion:**

- Endogenous organism lodged in the body tissue has significant role in incidences of POWI.
- Bacterial positivity can be reduced by use of povidon iodine and this ,in turn, reduces the POWI caused by endogenous organism.



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**Objective :**

The general objective is to find out the rate (incidence) and causative microorganisms of post operative wound infection in Bir Hospital.

The specific objective of this study is to find out the causative micro organism those are responsible for post operative wound infection present locally in the body of the patients (endogenous) and to recommend ways to decrease the post operative wound infection in the hospital based on the study.

**Background:**

Post operative wound infection rate is very high in surgical ward of Bir Hospital causing increased morbidity, prolonged hospitalization and economic burden to the patients and the institution too.

Invasive microbial infection is the most common cause of significant postoperative morbidity. So far as general surgery is concerned the main source of contaminating organism is in the patients own tissue. Wound infection is rarely observed before 3<sup>rd</sup> and 4<sup>th</sup> post operative day, because a primary closed wound has no resistance at all to bacteria swabbed on its surface during the first six hours, but after that time it becomes increasingly difficult to infect the wound until at 5<sup>th</sup> day. After the introduction of antiseptic principle in surgery by Joseph Lister in 1867, the infection rate came down from 90% to 20%, but complete reduction in the infection rate wasn't still possible.

The wound infection rate depends upon many risk factors like type of wound, age of patients, nutrition of the patient, pre existing diseases, length of operating time, tissue damaged, microorganism present in the tissue locally or generally etc. In this study we are co-relating whether the micro organization present in the area of operation (surgery) are the causes for post operative infection in Bir Hospital.

## Materials and Method:

All patients under going elective and emergency operation during the period of 12 months from October 2002 to September 2003 in the General Surgical Unit II of Department of Surgery, Bir Hospital were prospectively included.

A detailed relevant information were recorded which includes name, age, sex, address, chief complain, history, any associated disease, past, personal and family history.

Accordingly clinical examination were done to come to a provisional diagnosis. Emphasis was given to determine if there is any source of local or distant infection and other finding like general hygiene, coexisting diseases, nutritional status which may reflect post operative wound infection. Base line and diagnostic investigations were done to confirm the diagnosis and determine if there is any evidence of acute, chronic infection present or any evidence of chronic diseases which may reflect the incidence of the post operative wound infection.

All these information were recorded in the proforma.

After the anesthesia a swab for culture and sensitivity was taken from the site of the incision, from the skin (A<sub>1</sub>). The site of incision and its periphery was painted with 5% povidon Iodine and was left to dry, and then, the second swab for culture and sensitivity was taken from the same site (A<sub>2</sub>).

After opening the peritoneum or superficial structure a third swab (B) was taken from the site where the main surgical procedure was going to be performed.

After completion of the surgical procedure, the peritoneum and muscle and facial layer were closed and then again swab was taken from subcutaneous area (C) before closing the skin layer.

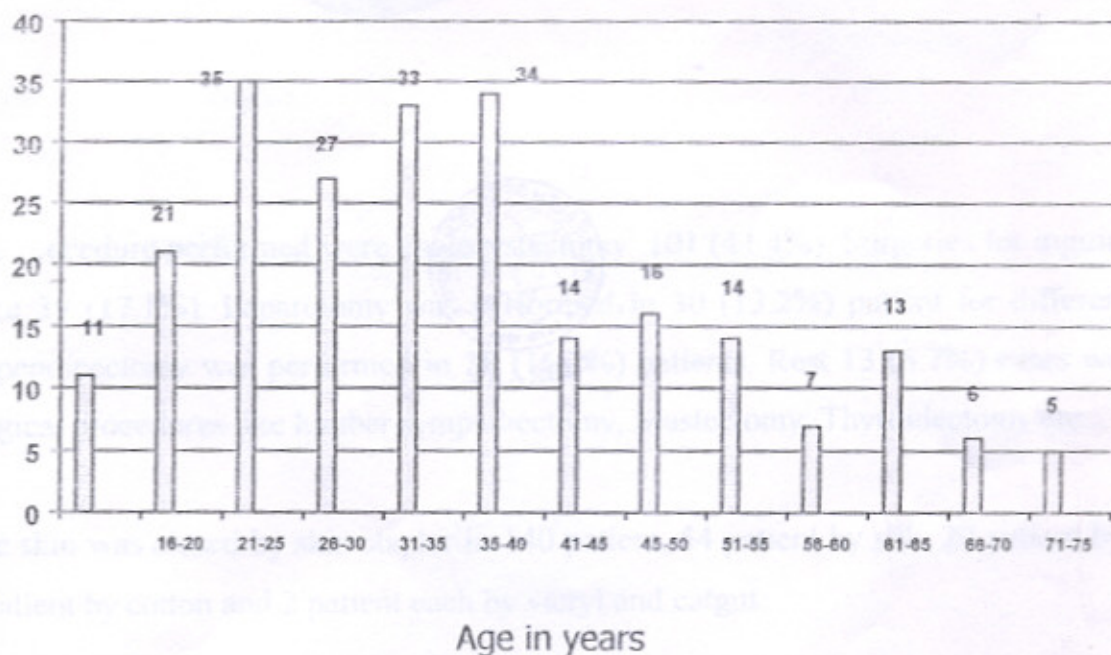
All swabs taken from different level were sent for culture and sensitivity. After 48 hours every wound were inspected. Any signs of inflammation was observed, and recorded. Monitoring of the wound was done on the 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> postoperative day. Any pus or any other discharge was sent for culture and sensitivity. Positive culture from the discharge was considered to be infected wound. The entire patients were given 3 doses of pre operative antibiotics. After which antibiotics were prescribed when indicated only.

### Result:

A total of 325 patient were taken in the study during the 12 months period. But a complete follow up was obtained in 227 patients (69.8 %) who make up this study group and 98 patients were unable to follow up. The entire patients were followed up for 7 days. It was not possible to follow up the patient for more than that period due to different unavoidable reasons. Eighteen patients developed superficial skin infection (7.92%)

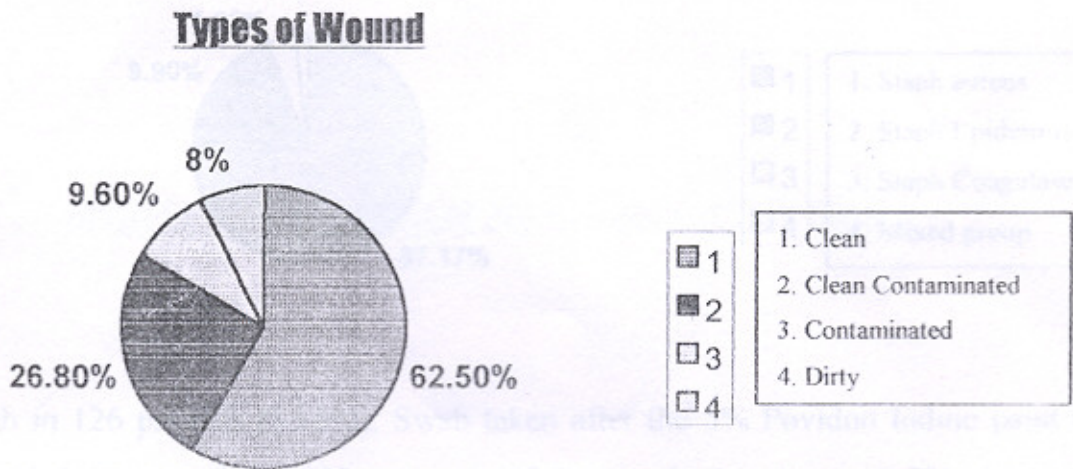
Out of 227 patient 103 were male and 124 were female patients with the age ranging from 10yr to 75 year old. The age group is as follows as shown in the fig.1

Fig. 1



The types of wound were observed; clean wound 142 (62.5 %); clean contaminated 61 (26.8%); contaminated 22 (9.6%) dirty wound were 2 (.8 %).

Fig. 2



The procedure performed were cholecystectomy 101 (44.4%). Surgeries for inguinal hernia were 39 (17.1%). Laparotomy was performed in 30 (13.2%) patient for different causes; Appendicectomy was performed in 38 (16.7%) patients. Rest 13 (5.7%) cases were others surgical procedures like lumber sympathectomy, Mastectomy, Thyroidectomy etc.

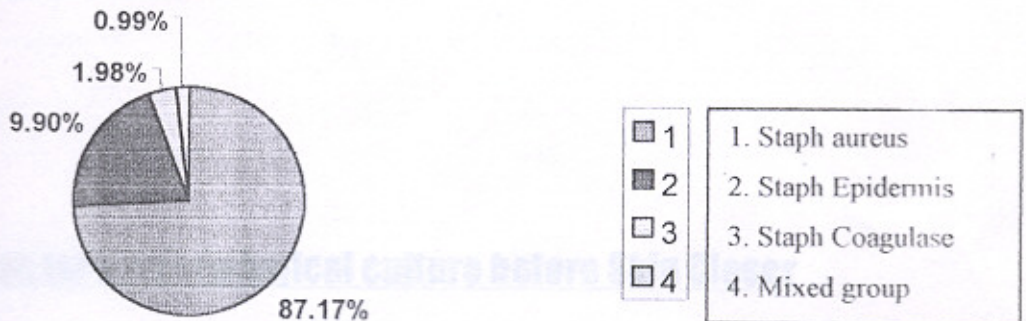
The skin was closed by skin stapler in 140 patient, 54 patient by silk, 20 patient by prolene, 9 patient by cotton and 2 patient each by vicryl and catgut.

Drain was kept in 53 patient, which was removed after 48 hours.

The swab for bacteriological culture and sensitivity were taken at different level of the procedure from incision to closure of wound. Swab taken in all the patients (227) from the skin before antiseptic paint revealed bacterial positive in 101 patients (44.4%). Organism isolated were Staph aureus in 88 patients (87.17%) Staph Epidermidis in 10 patients (9.9%) Staph Coagulase in 1 patients (0.99%) and 2 patients (1.98%) had mixed growth.

Fig. 3

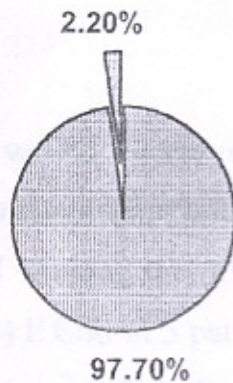
**Swab For Bacteriological Cultured Before Paint**



No growth in 126 patients (55.5%). Swab taken after the 5% Povidon Iodine paint in the Skin, revealed no growth in 222 patients (97.7%), only 5 patients (2.2%) has positive growth of Staph aureus.

Fig.4

**Swab for bacteriological culture after paint**



Swab that was taken from the site of main surgical procedure revealed bacterial positive in 12 patients (5.28%). Common organism isolated was E. Coli in 7 patient (58.33%), Staph aureus in 3 patients (25%) and mixed growth in 2 patients.

Among the 18 POWI patients, endogenous bacteria were present in 11 patients (61.1%).

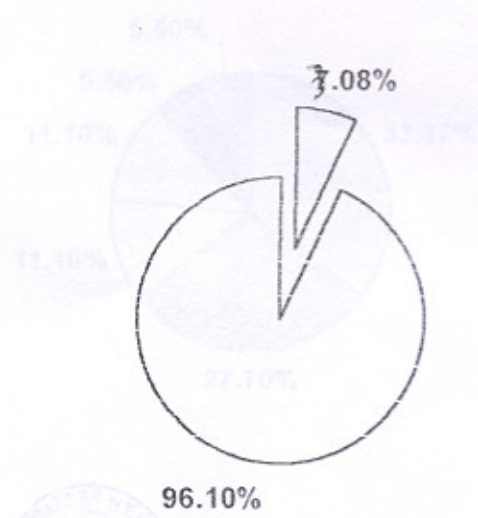
Swab taken from the subcutaneous site before closing the Skin revealed no growth in 220 patients (96.91%) and Organism isolated in 7 patients (3.08%) commonly Staph aureus in 5 patients (71.42%) E.coli in 2 patients (28.57%).

Out of 18 POWI, 6 patients (33.33%) had same organism present endogenously especially in

Fig. 5 Pre antibiotic point.

Fig. 6

### **Swab for bacteriological culture before Skin Closer**



Regarding the antibiotic sensitivity - the organism isolated from skin before antibiotic point (A) were mainly sensitive to ciprofloxacin were 84 (81.16%), Cephalosporin

There was no postoperative wound infection (POWI) in 209 patients (92.07%), 10 patient (4.40%) had sign of slight inflammation with bacterial negative discharge. On 18 patients (7.92%) had positive POWI. Among the 7.92% positive POWI cases. Staph aureus was isolated in 6 patients (33.3%) E.Coli in 5 patients (27.7%), Enterobactor and P. aeruginosa in 2 patients (11.1%) each and Pseudomonas, Streptococci Epidermis and Staph pyococneous in 1 patient (5.5%) each.

Similarly organism isolated from the subcutaneous area C were sensitive to Ciprofloxacin 5 (71.42%) to Cephalosporin 2 (28.57%)

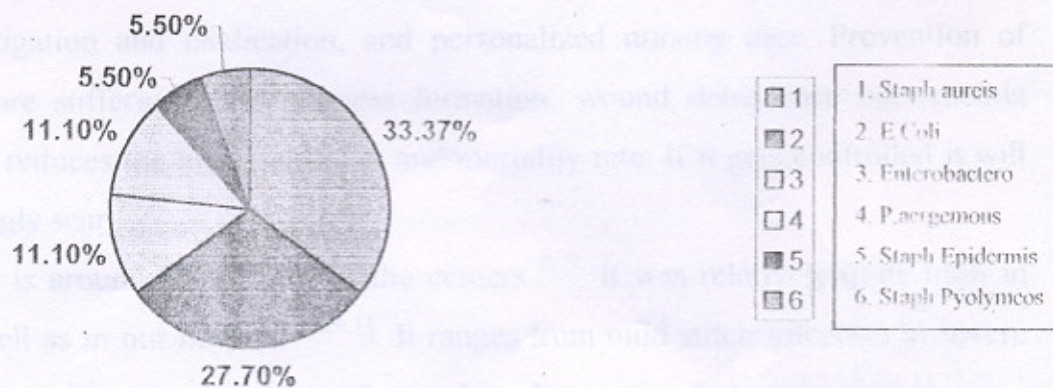


Among the 18 POWI patients endogenous bacteria were present in 11 patients (61.11%) specifically 10 (55.5%) in Skin before antiseptic past and 2 (11.11%) in the main operation area. 7 patients (38.88%) had no endogenous source of organism.

Out of 18 POWI, 6 patients (33.33%) had same organism present endogenously specially in skin before antiseptic paint.

Fig. 6

### **POWI Bacteria isolated)**



Regarding the antibiotic sensitivity - the organism isolated from Skin before antiseptic paint (A<sub>1</sub>) were mainly sensitive to ciprofloxacin were 84 (83.16%), Cephalosporine (Cephalaxin) were 7 (6.93%), Ofloxacin were 5 (4.95%), Aminoglycoside was (0.99%).

The Organism isolated from skin after povidon iodine paint A<sub>2</sub> were mainly sensitive to Ciprofloxacin 4 (80%) and to Cephalosporine 1 (20%),

The organisms isolated from the area of main surgical procedure were sensitive to Ciprofloxacin 7 (58.33%) to Ofloxacin 3 (25%); Gentamycin 1 (8.33%) one was mixed growth.

Similarly organism isolated from the subcutaneous area 'C' were sensitive to Ciprofloxacin 5 (71.42%) to Cephalosporine 2 (28.57%)

The organism isolated from the POWI D were sensitive to Ciprofloxacin 9 (50%) to Cephalosporin 4 (22.22%), 2 cases (11.11%) each were sensitive to Aminoglycoside and Ofloxacin. One case (5.55%) was resistant to all antibiotics.

**Discussion:** follow up of 45 days after surgery to ensure infection, was considered by some authors<sup>7,9,11</sup> but in our study we had to follow up the patient till the patients discharge from

Postoperative wound infection may be caused by many factors<sup>2,7,9,13,16,26</sup>. They may be local, systemic, and may be socio economic status or may be due to other factors. One of them may be the endogenous organism that can cause postoperative wound infection.<sup>2,7,8,10</sup>

It is very much important to prevent POWI because it shortens the hospital stay<sup>25, 26</sup>, reduces the investigation and medication, and personalized nursing care. Prevention of POWI reduces more suffering, pain, abscess formation, wound dehiscence bacteraemia septicaemia etc. It reduces the high morbidity and mortality rate. If it gets controlled it will not leave with an ugly scar<sup>7</sup>.

The rate of POWI is around 4% in best of the centers<sup>7, 9</sup>. It was relatively quite high in many centers as well as in our hospital<sup>2,4,6,11</sup>. It ranges from mild stitch infection to severe wound infection depending upon the types of wounds and causative factors.<sup>1,2,3,4,5,6, 13,22,23</sup>

This study is focused to see presence of any organism in the skin or in the deeper tissue those are responsible to cause POWI<sup>8,10</sup>.

To define wound infection one school confirms that there must be purulent discharge with positive culture, whereas another school confirms wound infection do not necessary drain pus and not universally culture positive<sup>7, 9,12,14</sup>. But we follow the previous school conception of positive pus culture. Foot hill 1980 studied of 62939 wounds and generated rate of wound infection from 1.5% to 40% depending upon type wound<sup>22, 23</sup>. Sabistin has spelled out the most surgical services have an infection rate of 20% to 40% in clean wound and it increases in complicated and contaminated wound upto 50 – 60%<sup>10</sup>.

Over all POWI was reported to be 15.1% by Lawaletal 9.4% by Eltahawyetal 3.4% by Kurz 27.8% by Ojelbe 9.4% by Twum 16.19% by BMS similarly the overall post operative wound infection in our study happen to be 7.92%. If we look at the rate of POW I in elective

cases it was 7.87% and in emergency cases was 8% in our study to compare with 2.9% and 5.1% respectively of Gitetal<sup>3,28</sup>. In both the study rate of POWI is higher in emergency cases compared to elective one<sup>2</sup>.

Secondly a follow up of 45 days after surgery to ensure infection, was considered by some authors<sup>7,9,15</sup> but in our study we had to follow up the patient till the patients discharge from hospital or till the day the patients comes back for removal of stitch in OPD basis. Due to different reason long term follow up is not practical in our setup<sup>7,15</sup>.

As there are many causative factors for POWI but in our study we are confined to see the endogenous organism present in the site of surgery (operation) if at all are responsible for POWI<sup>29</sup>.

The culture swab taken from incision site of the skin before antiseptic paint, 44.49% showed the positive growth. Among the organism Staph aureus was isolated in 87.12% Staph. Epidermis was 9.90% and others were minor organism<sup>4,29</sup>.

Study has reported that so far as general surgery is concerned the main source of contaminating organism is endogenous<sup>5</sup>. It has been seen that patient hospitalized for sometime have increase number of resistant organism<sup>2</sup> and he adds that skin is an important source of organism contaminating surgical wound (Sabistin<sup>2</sup>).

Out of 227 cases 18 patients had POWI making it 7.92%. Out of 18 POWI 55.55% had positive bacterial growth in main surgical the skin before antiseptic paint and 11.11% had positive growth in procedural site. So in POWI cases 66.66% cases had endogenous organism causing the POWI. It shows that endogenous organism plays a vital role in POWI<sup>10,5</sup>. It has been observed that in 33.33% POWI cases the same organism was isolated that was present in the skin providing that in one third of cases organism lodged in skin are responsible for POWI<sup>10,5</sup>.

The commonest organism isolated from those POWI case were at large Staph aureus in 33.33%<sup>5</sup> and second commonly organism isolated were E. Coli in 27.77%, thirdly Pseudomonas group in 16.66%, then Enterbactor in 11.11% cases rest Staph Epidermis and Staph pyocynose in 5.55% each<sup>3,4,6,11,14</sup>.

In similar type of study by Twum – Staph aureus was isolated in 23.7% E. coli 16.9%, Staph Epideremis is 13.5% P. aurigenosa in 13%<sup>17</sup>, another study in Bir Hospital showed E coli 23%, Pseudomonas in 18%, Staph aureus and Proteus 16%. More over in many study Staph aureus is in the top of the list as much as 36.1% in Malesian study and 33.3% in Foresee study.

Regarding the antibiotic sensitivity pattern it was observed that most of the organism were sensitive to Ciprofloxacin 9 (50%) where as Cephalosporine group (3<sup>rd</sup> generation) sensitivity in 4 22.2% 2 (11.11%) were sensitive to Ofloxacin and Aminoglycosides each 5.55% was resistant to all antibiotics. Out of 138 positive culture and sensitivity tests performed from different sites Ciprofloxacin was sensitive in 105 tests (76.08%).

In the study it was observed that antiseptic paint in the skin has got a very important role in preventing POWI. Before the paint 44.49% patient had positive growth, but after the antiseptic paint by 5% povidon Iodine the growth has come down to 2.2%. There was no POWI in those positive 2.2% of cases. So much so no growth was observed in swab taken from the subcutaneous layer after povidon iodine paint before skin closer. It was observed that iodophor preparation is most effective when allowed to dry on skin<sup>9,10</sup>.

Using antibacterial soap or povidon iodine in skin before operation is to reduce the residential bacteria. All cutaneous infection should be controlled or cleared before the time of an elective operation<sup>10</sup>. Nonetheless, more studies are necessary to confirm the current findings.

## **Conclusion**

The overall Post Operative Wound Infection was observed to be 7.92% in Bir Hospital. It was also observed that rate of POWI is higher in Emergency case compare to Elective cases, so as the rate of POWI may be different according to the type of wound.

It has been proved that many factors influence the Post Operative Wound Infection. But it is evident that endogenous organism lodged in body tissues influences the POWI significantly.

Most of the organism isolated from skin and the post operative wound were mostly sensitive to ciprofloxacin where as cephalosporine group comes next.

It was very evident that povidon iodine used externally and internally has very significant role in reducing the bacterial positivity, hence –forth minimizes the rate of POWI.

## **Acknowledgement:**

Our sincere thanks to NHRC, Ministry of Health, HMGN, for providing us the opportunity to carry out the study on postoperative wound infection. We are extremely grateful to the Medical Superintendent of Bir Hospital and Head of Department of Surgery, Bir Hospital, for allowing us to conduct this research work. We are also thankful to the Head of Department of Pathology and Mrs. Jyoti Shrestha, In charge of Microbiology department, Bir Hospital, for their help to perform the laboratory studies. We express our gratitude to Dr. Ashish Kiran Shrestha and Mr. Gyanendra Dhakal who took their valuable time for preparing the manuscripts.

Finally, we express our gratitude to all my patients for their cooperation in carrying out this study.

TOTAL POST OPERATION WOUND INFECTION CASES

Sn.	Name/ Age / Sex	Operation	Type of Wound	Antibiotic	Drain	Skin Suture	A <sub>1</sub>	A <sub>2</sub>	B	C	D	Sensitivity
1	RD, 30/F	Laparotomy	CC	Pre/Post	X	Stap.	X	X	Stap.	X	SA	Oflax
2	S, 35/F	Cholecystomy	CC	Pre/Post	X	Stap.	SA	X	X	X	SA	Oflax
3	R, 49/M	Laparotomy	Conta	Pre/Post	✓	Stap.	SA	X	E.Coli	X	SA	Genta
4	T, 35/F	Cholecystomy	Cle	Pre/Post	X	Stap.	X	X	X	X	Pseudomonsa	Cepholo, S
5	R, 30/F	Appendectomy	Cl.Conta	Pre/Post	✓	Stap.	SA	X	X	X	P. arigenosa	Cipro
6	J, 16/F	Appendectomy	Cl.Conta	Pre	X	Stap.	SA	X	X	X	Ecoli	Cepholo, S
7	M, 17/F	Cholecystomy	CC	Pre/Post	X	Stap.	Stap	X	X	X	Strepto Epider.	Gipro
8	GG, 18/F	Psoas Abscess Drain	Dirty	Pre/Post	✓	Silk	X	X	X	X	P. arigenosa	Cepholo, S
9	GK, 50/F	Cholecystomy + Jej.	Cl.Conta	Pre/Post	✓	Stap.	X	X	X	X	Ecoli	Resistant
10	BP, 20/F	Laparotomy	Conta	Pre/Post	X	Stap.	X	X	X	X	SA	Cipro
11	KS, 45/F	Cholecystomy	Cl.Conta	Pre/Post	X	Stap.	SA	X	X	X	Ecoli	Cipro
12	MP, 57/F	Cholecystomy	Cl	Pre/Post	✓	Stap.	X	X	X	X	SA	Cipro
13	GG, 35/F	Cholecystomy	Cl	Pre/Post	X	Stap.	SA	X	X	X	SA	Cipro
14	RD, 30/F	Laparotomy	Conta	Pre/Post	X	Stap.	SA	X	X	X	SA	Cipro
15	SB, 18/F	Cholecystomy	Cl	Pre/Post	✓	Stap.	X	X	X	X	Enterobacter	Cipro
16	KN, 12/F	Laparotomy	Cl.Conta	Pre/Post	✓	Stap.	SA	X	X	X	Ecoli	Cipro
17	CB, 49/F	Cholecystomy	Cl.Conta	Pre/Post	X	Stap.	SA	X	X	X	Ecoli	Amikacin
18	KN, 17/F	Laparotomy	Conta	Pre/Post	✓	Cotton	X	X	X	X	Enterobacter	Cipro

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