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The pattern of Bacterial Growth in Infected Wounds Following Emergency Laparotomy with The Variation of Sensitivity to Antibiotics-A Study of 58 Cases

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Abstract

Background: An emergency laparotomy is a commonly performed operation by general surgeons where the abdomen is opened and the abdominal organs examined for any injury or disease. A few major indications for an emergency laparotomy are perforation peritonitis, acute intestinal obstruction, burst appendix and blunt or penetrating abdominal injuries either due to roadside accidents, fall from height or gun shot or stab injuries. The study aims to see the causative organism of wound infection and prevent misuse of antibiotics in infected wounds following emergency laparotomy. **Material & Methods:** This observational study was carried out in the Department of Surgery, Khulna Medical College, Khulna from July 2008 to June 2009. A total of 58 specimens consisting of wound swabs, pus, purulent exudates or wound discharge were collected from patients who had emergency laparotomy at Khulna Medical College. **Results:** Out of 58 patients with abdominal operation developed wound infection following emergency laparotomy, 14 cases were ileal perforation, 19 cases were duodenal ulcer perforation, and 9 cases were sigmoid volvulus, and F13 cases were small intestinal obstruction and 3 were blunt abdominal trauma. Among 58 postoperative abdominal wound infected cases all require antibiotics and regular dressing 60.34% require a secondary stitch 25.86% require no secondary stitch and 13.79% required wound excision with a secondary stitch. **Conclusions:** Postoperative complications are more common after emergency laparotomies compared to elective laparotomies. Maximum complications were found in patients with delayed presentation or in patients having any associated co-morbidities. Therefore, early detection and immediate intervention with better postoperative care can minimize postoperative complications. The present study suggests that proper awareness among rural populations, adequate health education to seek prompt medical aid, a good referral and efficient transportation can reduce the delayed presentation which in turn will prevent postoperative complications following emergency laparotomy.

Keywords:- Bacterial growth, Infected wound, & Laparotomy.

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INTRODUCTION

Invasive microbial infection is the most common cause of significant postoperative morbidity and mortality. Infection increases the discomfort and disability experienced by patients following emergency operations and may in their most severe forms endanger life.[1] Wound sepsis continues to be the bugbear of emergency abdominal surgery where the procedure is often inevitably performed on infected tissue.[2] The availability of antibiotics led surgeons to believe that infection would finally be controlled, but it did not have to happen. Based on contamination, the surgical wound is classified into four categories. Clean wound-infection rate 1.5-2%, clean contaminated wound-infection rate 5 7%, contaminated wound-infection rate 15.2-20%, dirty wound-infection rate up to 40%.[3,4] The risk of wound infection is not entirely determined by the degree of contamination, however, many physiological & immunological factors limit the patient's resistance. Risk can be more precisely assessed by giving one point for each of the following (SENIC sore). (i) abdominal operation less than two hours (ii) Operation lasting more than 2 hours (iii) Contaminated operation (iv) More than three diagnoses exclusive of wound infection, a total score of 'l' indicates a risk of 1%, '2' indicates 8%, '3' indicates 17% & '4' indicates 28%.[5] Classically, the presence of the postoperative infection has been confirmed by documenting the typical clinical signs of inflammation along with drainage of purulent or culture-positive material from the wound. Through early diagnosis by clinical features and isolation of the organism from the wound by culture with the use of the most appropriate antibiotic obtained through antibiogram, the morbidity due to the post-operative wound infection can be reduced. The study aims to see the causative organism of wound infection and prevent misuse of antibiotics in infected wounds following emergency laparotomy.

MATERIAL AND METHODS

This observational study was carried out in the Department of Surgery, Khulna Medical College, Khulna from July 2008 to June 2009. A total of 58 specimens consisting of wound swabs, pus, purulent exudates or wound discharge were collected from patients who had emergency laparotomy at Khulna Medical College. The specimen was collected aseptically with sterile cotton-tipped swabs without contaminating with skin commensals and then the swab was taken in a sterile test tube and transported immediately to the microbiology laboratory. The samples were inoculated into Blood agar media, and MacConkey agar media and incubated aerobically at 370C for 24 hours. Isolation and identification of different bacteria were done by standard microbiological procedures, including colony morphology, Gram staining and biochemical tests.[6] Antimicrobial susceptibility testing was carried out by Kirby-Bauer disc diffusion technique using Mueller Hinton agar media and the zone of inhibition was measured as recommended by the Clinical and Laboratory Standard Institute. (CLSI) guidelines.[7] The following antibiotic discs from Oxoid Ltd. UK, were used, Amoxycillin (10µg), Cefradin (30µg), Ceftriaxone (30µg), Ceftazidime (30µg), Cefixime (5µg), Ciprofloxacin (5µg), Cotrimoxazole (25µg), Tetracyclin (30µg), Gentamicin (10µg), Amikacin (30µg), and Imipenem (10µg).

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Inclusion Criteria

- Clinically diagnosed patients of all ages and of both sexes having bacterial growth in the wound with pus or discharge draining from the infection site or wounds having any signs of infection (pain or tenderness, localised swelling, redness or heat) or the wound that has not healed within ten days after the injury were included in the study.

Exclusion Criteria

- Patients who received antibiotics within 24 hours or had wounds dressed with the antiseptic solution were excluded from the study.

All data were presented in a suitable table or graph according to their affinity. A description of each table and graph was given to understand them clearly. All statistical analysis was performed using the statistical package for social science (SPSS) program, and Windows. Continuous parameters were expressed as mean±SD and categorical parameters as frequency and percentage. Comparisons between groups (continuous parameters) were made by Student's t-test. Categorical parameters compared by Chi-Square test. The significance of the results as determined by a 95.0% confidence interval and a value of $P<0.05$ was considered to be statistically significant.

RESULTS

Out of 58 patients with abdominal operation developed wound infection following emergency laparotomy, 14 cases were ileal perforation, 19 cases were duodenal ulcer perforation, 9 cases were sigmoid volvulus, and F13 cases were small intestinal obstruction and 3 were blunt abdominal trauma. Wound infection rate of specific type of operation were 24.14%, 32, 76%, 15.52%, 22.41%, and 5.17% respectively [Table 1]. In this series, among all the infected cases the rate of infection was 3.45% in clean wounds, 15.52% in clean-contaminated wounds, 39.65% in contaminated wounds and 41.38% in dirty wounds [Figure 1]. Table-3 show that among 58 postoperative abdominal wound infected case organisms were as follows: Escherichia coli 65.52%, stop. Aureus 13.78%, Proteus 6.90%, Klebsiella 6.90%, coliform 1.72%, and 5.14% no bacteria could be isolated. [Table 4] among 55 postoperative abdominal wound infected culture reports shows sensitivity to different antibiotics as follows: Doxycycline 55, Ciprofloxacin 46, Ceftriaxone 38, Fimoxyclav 49, amoxicillin 39, Clindamycin 50, Cloxacillin 37, and Meropenum 55 whereas the number of resistance cases was Ciprofloxacin 9, Ceftriaxone 17, Fimoxaclav 6, Amoxicillin 16, Clindamycin 5, Closacillin 18, Meropenem and Doxycycline ware not resistant to These organisms. [Table 5] shows that among 58 postoperative abdominal wound infected cases all require antibiotics and regular dressing 60.34% require a secondary stitch 25.86% require no secondary stitch and 13.79% required wound excision with a secondary stitch.

Table 1: Rate of wound infection (N:58).

Name of disease	Name of operation	Frequency	Percentage
Ileal perforation	Repair peritoneal toileting/ileostomy	14	24.14
Duodenal ulcer perforation	Repair of perforation and peritoneal toileting	19	32.76
Sigmoid volvulus	Resection and anastomosis/colostomy	09	`15.52
Small intestinal obstruction	Resection and anastomosis	13	22.41

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Blunt abdominal trauma	Laparotomy	03	5.17
Total		58	100.00

Table 2: Types of organisms in postoperative abdominal wound infection.

Name of organism	Frequency	Percentage
Escherichia coli	38	65.52
Staph. Aureus	8	13.78
Proteus	4	6.90
Klebsiella	4	6.90
Coliform	1	1.72
No growth	3	5.18

Table 3: Different Patterns of an anti-bio gram.

Name of antibiotics	Sensitive	Resistance
Doxycycline	55	0
Ciprofloxacin	46	9
Ceftriaxone	38	17
Fimoxyclav	49	6
Amoxicillin	39	16
Clindamycin	50	5
Cloxacillin	37	18
Meropenem	55	0

Table 4: Management of Postoperative wound infection.

Management	Frequency	Percentage
Antibiotic according to C/S + dressing + secondary stitch	35	60.35
Antibiotic according to C/S + wound dressing	15	25.86
Antibiotic according to C/S wound excision + delayed closure	8	13.79

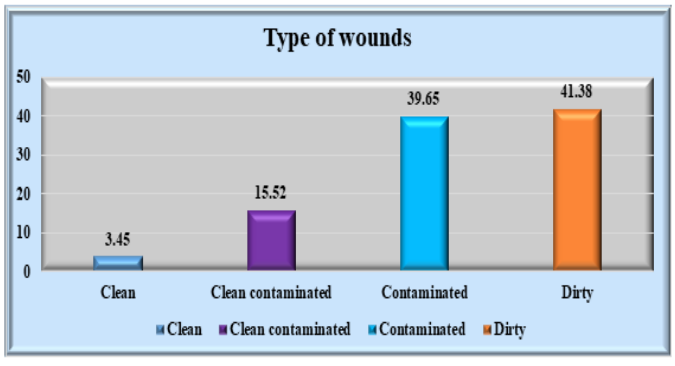

Figure 1: Rate of infection related to wound types: among all infected cases.

DISCUSSION

Invasive microbial infection is the most common cause of significant postoperative morbidity and mortality. Surgical infection studied by Lewis and Joseph, hundreds of years ago is still a subject of controversy and problem all over the world. Different workers in this field have given their thoughts and ideas on the control of infection.[8] In this series, 58 cases were included. They were admitted to Khulna Medical College Hospital, underwent

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emergency abdominal surgery, and developed wound infections from July 2008 to June 2009. Wound infections developed after different abdominal surgery were as follows ileal perforation 14, duodenal ulcer perforation 19, sigmoid volvulus 9, small intestinal obstruction 13 and blunt abdominal trauma 3. The name of operations and the number of cases with the percentage of wound infection are shown in [Table 1]. The rate of wound infection about the type of wound is shown in [Table 2], the types of organisms in postoperative abdominal wound infection in [Table 3-4] shows different Patterns of antibiogram and [Table 5], the management of Postoperative wound infection. After admission patients were examined thoroughly to establish the diagnosis. Resuscitated whenever necessary in emergency cases and relevant investigation were done before emergency surgery". All patients were cleaned and shaved before the operation. The abdomen was swabbed from the proposed site of incision to the periphery. The transient bacteria on the surface are killed by skin antiseptics but cannot destroy the deep resident bacteria could avoid being destroyed. In this series, all of the patients were washed with povidone-iodine which is safe and effective to reduce skin surface bacteria.[9] The wound was tried to prevent contamination from the infected intraabdominal content. The drain was applied in all infected abdominal surgery where necessary. The abdomen was closed in layers. Wound infection rate varies according to the type of operation.[10,11] In this series among the 58 infected cases the wound infection rate in the clean wound was 3.45% (2 of 58 cases) clean-contaminated cases were 15.52% (9 of 58 cases). Contaminated cases were 41.38% (24 of 58) and dirty cases were 39.65% (23 of 58). This series shows the wound shows that the rate of postoperative wound infection is higher in dirty wounds. A ten years prospective study of 62.939 wounds by Cruse PJE and Frood R. The wound infection rate in the clean wound was 1.5%, clean-contaminated wounds 7.7%, contaminated wound 15.2%, dirty wound 40%.[12] The pattern of surgical infection at Chittagong Medical College Hospital by Al SL and Khan AnGa-the wound infection ate in clean wounds 2.5% clean contaminated 28.6%, and contaminated wounds 54.8.[8] The rate of wound infection as reported by Rasul G and Ashraf SA shows no infection in clean and 23% of contaminated cases.[13] In this series among 58 wound-infected cases, negative results are found in three cases. This may be due to the use of antibiotics. Causative organisms were detected in 55 postoperative abdominal wound-infected cases. organisms are as follows 65.52% Escherichia coli, Stap. aureus 13.78%, Proteus 6.90%, Klebsiella 6.90%, Coliform 1.72%, and 5.18% no bacteria could be isolated. This study shows that the maximum wound infection is due to Escherichia coli. The next common organism was Stap. aureus. This finding showed similarities with the work of Martin, Din Mohammad, and Asraf.[14,15,16] The average hospital stay after abdominal surgery is 7 days in non-infected cases. Infected patients stayed in the hospital after the operation varies from 15 to 28 days. So the study reveals that postoperative wound infection prolongs the hospital stay of the patients. So this is more cost to the patients and the hospital as well.

Limitations of the study

This is a small study; the result should be testified with a larger sample. Anaerobic culture

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was not done. Sometimes time was taken to send the sample for culture.

CONCLUSIONS

In many a case, postoperative morbidity and mortality are directly related to wound infection. Wound infection is related to the interaction between microorganisms, environmental factors and host defence mechanisms. The infection rate is known to be higher in emergency operations due to more contamination of wounds in emergency surgery. In this series, it is shown that wound infection is higher in dirty wounds than in clean or clean-contaminated wounds. This study showed that wound infection after abdominal surgery was mostly caused by Gram-negative organisms. Among the Gram-negative bacilli, Escherichia coli was the most common isolated organism, which is the normal inhabitant of the gastrointestinal tract and a common organism causing biliary tree infection. By knowing the common organism responsible for postoperative abdominal wound infection and by using the appropriate antibiotic against the harmful bacteria, we can reduce the mortality and morbidity related to postoperative wound infection significantly. Surprisingly, a simple cheap oral antibiotic is sensitive to bacteria whereas a costly and parenteral antibiotic is resistant to that organism by this way hospital stay patients and hospital costs can also be reduced. It also helps to reduce the workload of the hospital, which would help provide the patients with better services. It would offer a high turnover of the patients. So this study has opened up a new vista in postoperative wound infection treatment.

REFERENCES

1. Richmond JS, Berlin JS, Fishkind AB, Holloman GH Jr, Zeller SL, Wilson MP, et al. Verbal De-escalation of the Agitated Patient: Consensus Statement of the American Association for Emergency Psychiatry Project BETA De-escalation Workgroup. West J Emerg Med. 2012;13(1):17-25. doi: 10.5811/westjem.2011.9.6864.
2. Lazare A, Eisenthal S, Wasserman L. The customer approach to patienthood. Attending to patient requests in a walk-in clinic. Arch Gen Psychiatry. 1975;32(5):553-8. doi: 10.1001/archpsyc.1975.01760230019001.
3. Eisenthal S, Lazare A. Evaluation of the initial interview in a walk-in clinic. The clinician's perspective on a "negotiated approach". J Nerv Ment Dis. 1977;164(1):30-5. doi: 10.1097/00005053-197701000-00006.
4. Eisenthal S, Lazare A. Evaluation of the initial interview in a walk-in clinic. The patient's perspective on a "customer approach". J Nerv Ment Dis. 1976;162(3):169-76. doi: 10.1097/00005053-197603000-00003.
5. Eisenthal S, Koopman C, Lazare A. Process analysis of two dimensions of the negotiated approach in relation to satisfaction in the initial interview. J Nerv Ment Dis. 1983;171(1):49-54. doi: 10.1097/00005053-198301000-00009.
6. Deane FP. A comparison of USA and New Zealand psychiatric patients' requests and clinicians understanding of patients' requests. Int J Soc Psychiatry. 1987;33(4):277-84. doi: 10.1177/002076408703300404.
7. Weinstein MP, Lewis JS 2nd. The Clinical and Laboratory Standards Institute Subcommittee on Antimicrobial Susceptibility Testing: Background, Organization, Functions, and Processes. J Clin Microbiol. 2020;58(3):e01864-19. doi: 10.1128/JCM.01864-19.
8. Humphries RM, Ambler J, Mitchell SL, Castanheira M, Dingle T, Hindler JA, et al. CLSI Methods Development and Standardization Working Group of the Subcommittee on Antimicrobial Susceptibility

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Testing. CLSI Methods Development and Standardization Working Group Best Practices for Evaluation of Antimicrobial Susceptibility Tests. J Clin Microbiol. 2018;56(4):e01934-17. doi: 10.1128/JCM.01934-17.
9. Chowdhury SK, Choudhury SD. Mass closure versus layer closure of abdominal wound: a prospective clinical study. J Indian Med Assoc. 1994;92(7):229-32.
10. Kapur BM, Shriniwas, Gupta A. Role of intraoperative wound contamination in post-operative wound infection in laparotomy. Indian J Med Res. 1985;81:508-13.
11. Dineen PA. A critical study of 100 consecutive wound infections. Surg. Gynecol Obstet. 1961;113:91.
12. Cruse PJ, Foord R. The epidemiology of wound infection. A 10-year prospective study of 62,939 wounds. Surg Clin North Am. 1980;60(1):27-40. doi: 10.1016/s0039-6109(16)42031-1.
13. Rasul G. Ashraf SA. The role of routine antibiotics in the prevention of wound infection after surgery. BMRC Bulletin. 1979;5(2):71074.
14. Alkaaki A, Al-Radi OO, Khoja A, Alnawawi A, Alnawawi A, Maghrabi A, et al. Surgical site infection following abdominal surgery: a prospective cohort study. Can J Surg. 2019;62(2):111-117. doi: 10.1503/cjs.004818.
15. Aga E, Keinan-Boker L, Eithan A, Mais T, Rabinovich A, Nassar F. Surgical site infections after abdominal surgery: incidence and risk factors. A prospective cohort study. Infect Dis (Lond). 2015;47(11):761-7. doi: 10.3109/23744235.2015.1055587.
16. Macefield RC, Reeves BC, Milne TK, Nicholson A, Blencowe NS, Calvert M, et al. Development of a single, practical measure of surgical site infection (SSI) for patient report or observer completion. J Infect Prev. 2017;18(4):170-179. doi: 10.1177/1757177416689724.

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