Original Research Article

A Comparative Study of Wound Infection Rates in Patients Receiving Pre OperativeIntraincisional Antibiotic Infiltration in Patients Undergoing Laparotomy for Perforation

Shashi Shankar Sharma[1],Prabhudayal Chouhan[2], Suneel Ahirwal[3],Avinash Gautam[4*]

[1]Associate Professor,Dept. of Surgery, M.G.M Medical College & M.Y. Hospital, Indore,M.P.,India
[2]RSO,Department. of Surgery, M.G.M Medical College & M.Y. Hospital, Indore,M.P.,India
[3]Associate Professor,Department of Microbiology, M.G.M. Medical College & M.Y. Hospital Indore,M.P.,India
4Assistant Professor,Department. of Surgery, M.G.M Medical College & M.Y. Hospital, Indore,M.P.,India

Received: 10-03-2021 / Revised: 23-12-2020 / Accepted: 31-05-2021

Abstract

Background and Method: This study was conducted in 100 patients (sample size) of intestinal perforation .in department of surgery at MYH Hospital and MGM Medical College, Indore (MP) after informed and written consent from the patient. A careful medical history suggest the source of the problem. Possible etiologies include the following. Penetrating injury or blunt trauma to the lower abdomen.NSAID intake or steroid intake.Treatment for ulcerative colitis or peptic ulcer.Abdominal pain, Vomiting, Hiccup History of travel in tropical area with symptom suggestive of typhoid fever.History of endoscopic procedure.History of chronic disease such as ulcerative colitis.**Results:** On post operative day 3, wound status of 80% controls was healthy, 12% controls had serous discharge and 8% controls had pus discharge present from the wound. The post operative wound status on day – 3 among both cases and controls was compared using chi-square test. The chi-square statistic is 4.6095. The p-value is 0.329758. The result is statistically not significant. On post operative day 5, wound status of 82% cases was healthy, 12% cases had serous discharge and only 6% cases had pus discharge present from the wound. On post operative day 5, wound status of 72% controls was healthy, 20% controls had serous discharge and 8% controls had pus discharge present from the wound. The post operative wound status on day – 5 among both cases and controls was compared using chi-square test. The chi-square statistic is 1.4675. The p-value is 0.832377. The result is statistically not significant. On post operative day 7, wound status of 86% cases was healthy, 8% cases had serous discharge and only 6% cases had pus discharge present from the wound.On post operative day 7, wound status of 56% controls was healthy, 6% controls had serous discharge and 38% controls had pus discharge present from the wound. The post operative wound status on day – 7 among both cases and controls was compared using chi-square test. The chi-square statistic is 36.4104. The p-value is < 0.00001. The result is statistically significant.**Conclusion:** Both intra-incisional and intravenous ceftriaxone preoperatively as compared to the patients that received just intravenous ceftriaxone. The result is not significant during the early post operative period at day 3 and day 5. But the signicantIn our study there was significant decrease in occurrence of SSI among the patients result at day 7 is suggestive that intra-incisional with intravenous ceftriaxone prophylaxis is more effective than intravenous ceftriaxone aalone for reducing SSI. Preoperative intra incisional antibiotics decreases the pace of SSI on account of the higher concentrations attained at the entry point site.

Keywords: Intraincisional, Laparotomy, Perforation & Infiltration.

Introduction

Surgical site infection (SSI) keeps on being a confounding issue since time unfading. It is one of the significant reasons for postoperative dismalness and mortality. Throughout the long term, sensible achievement has been accomplished toward this path by taking different aseptic measures, which were started in British (1827-1912). At first, the anti –infection agents were just directed post-operatively for treatment of effectively settled careful site disease[1]. Afterwards, the idea of anti-toxins, prophylaxis was presented. After organization of intravenous (iv) Anti microbial, there is circulation of anti-toxins, at first in the fundamental pool and afterwards in the fringe pool, which brings about a law grouping of the anti-microbial at the site where it is required the most[2].

**Correspondence*
Dr. Avinash Gautam

Assistant Professor, Dept. of Surgery, M.G.M Medical College & M.Y. Hospital, Indore (M.P.)
E-mail:

Surgical site infection (SSIs) still keep on being a critical issue for specialists, which represents practically 40% of clinic gained contaminations[3]. (SSI) builds up in the clinic, subsequently expending and spreading, increased time for recovery there by increasing the monetary weight to the nation.SSIs normally happen 5 to 6 days postoperatively, 90% of which happens inside 30 days after medical procedure. The objective of careful prophylaxis is to guarantee that a palpable tissue convergence of a medication with a sensible range movement against expected life forms is accomplished and kept up during the time of possible bacterial tainting of the injury. So life forms brought in to the injury during the activity would be destroyed right away[4].

Inability to keep up satisfactory serum and tissue levels all through the surgery improves the probability of the SSI. Polk and Lopez – Mayor, have underlined that injuries levels, not blood or serum levels, seem to decide the adequacy of specialists for prophylaxis of usable injury disease. This high tissue levels could be accomplished by a preoperative intraincisional infusion[5]. So to accomplish high objective tissue fixations with compelling anti-microbial as indicated

by the microbiological commonness of life forms in both clean debased, tainted and grimy careful cuts is the need of great importance[6].

Aims and Objectives

The rationale of study is to find a better method to prevent post-operative surgical site infection in cases of intestinal perforation and better management of patients who are undergoing for laparotomy.

Objectives

- Compare control of SSI among both case and control group
- This study was conducted to know the incidence of SSI in patients who are undergoing laparotomy for perforation and the use of Intra incisional Ceftriaxone antibiotics for prevention of SSI in that cases.

To compare the data with standard guidelines.

Materials and Methodology

After obtaining approval from ethical committee , the present study entitled "**A Comparative Study of Wound Infection Ratesin Patients Receiving Pre OperativeIntraincisional Antibiotic Infiltration in Patients Undergoing Laparotomy for Perforation"** Was conducted in 100 patients (sample size) of intestinal perforation in department of surgery at MYH Hospital and MGM Medical College, Indore (MP) after informed and written consent from the patient.

Criteria for selection: Patients who was diagnosed for intestinal perforation attending The casualty and from OPD and being referred from other department to department of surgery MGM Medical College and MYH Hospital, Indore and fulfill the inclusion and exclusion criteria.

Inclusion Criteria:

-Patients providing written consent

-patients Diagnosed with intestinal perforation.

- age>13 years attending MYH OPD or casualty admitted in my hospital

Exclusion Criteria:

-Patients not willing to give written consent.

-Patients below 13 year of age.

The Method of study consisted of –

1. Detailed history and through clinical examination as per structured proforma
2. Complete Blood Count
3. Renal function and Liver function test.
4. Blood sugar levels.
5. HIV &HBsAg.
6. Serum electrolyte
7. Radiological assessment by X ray abdomen erect after pushing 300 ml air by ryles tube. USG whole abdomen, CECT abdomen.

Assessment of perforation:A careful medical history suggest the source of the problem

Possible etiologies include the following.

- Penetrating injury or blunt trauma to the lower abdomen
- NSAID intake or steroid intake.
- Treatment for ulcerative colitis or peptic ulcer.
- Abdominal pain, Vomiting, Hiccup History of travel in tropical area with symptom suggestive of typhoid fever.
- History of endoscopic procedure
- History of chronic disease such as ulcerative colitis.

Investigation for perforation:

- X ray abdomen in standing position.
- USG whole abdomen with pelvis
- CECT Abdomen

Study Design and Measurement

The study is a prospective, comparative clinical study. Patients who were fit as per the inclusion criteria were randomly assigned to two groups. One group is control group and givepre operative antibiotic prophylaxis by intravenous ceftriaxone one gram only. And another group which is trial group give intra incisional ceftriaxone one gram Subcutaneously by dissolving in (10 ml) Sterile water along with one gram ceftriaxone by intravenous route.

Technique for intra incisional antibiotic infiltration:

After allotting the group with the help of random number table, the procedure was properly informed to the patients and written consent taken by patients. Abdominal wall shaved properly and patient shift to operation theatre and after induction of anaesthesiapenting and draping done under sterile condition and one gram ceftriaxone dissolve in 10 ml sterile water properly and infiltrate around one cm beyond the incision site Subcutaneously.

Assessment of wound status

Wound assessed on post op. day three, post op. day five and post op day seven for any discharge, colour of wound, foul smell, wound gape, wound dehiscence etc.

Study Design and Measurement

The study is a prospective, comparative clinical study. Patients who were fit as per the inclusion criteria were randomly assigned to two groups.

The patients were explained the entire treatment and follow-up procedure by the investigator and the patients were treated for perforation.

Detailed history was taken in all cases regarding duration, mode of onset progression ,etiological factor, progression and associated symptoms.

Wound status examination was done in all these patients and wound was assessed of its characteristics and photographed at the beginning on post op. day three, post op. day five and post op. day seven.

Dressing Technique: On post op. day three dressing of wound open carefully under aseptic precaution and examine properly for any discharge ,swelling , smell ,wound gape and wound cleaned by normal saline and betadine socked gauge piece and again covered by sterile gauge piece after application of betadine ointment.

If any discharge present in collect sample and send to laboratory for routine and microscopic examination and for culture and sensitivity.

Table 1: Post operative wound status in Case group on post operative Day -03

S. No.	Day 3	No.	Percentage
1	Healthy	46	92%
2	Serous dis	3	6%
3	Pus dis.	1	2%

On post operative day 3, wound status of 92% cases was healthy, 6% cases had serous discharge and only 2% cases had pus discharge present from the wound.

Table 2: Post operative wound status in control group on post operative day -3

S. No.	Day 3	No.	Percentage
1	Healthy	40	80%
2	Serous dis	6	12%
3	Pus dis.	4	8%

On post operative day 3, wound status of 80% controls was healthy, 12% controls had serous discharge and 8% controls had pus discharge present from the wound.

The post operative wound status on day – 3 among both cases and controls was compared using chi-square test. The chi-square statistic is 4.6095. The p-value is 0.329758. The result is statistically not significant.

Table 3: Post operative wound status in case group on post operative day - 05

S. No.	Day 5	No.	Percentage
1	Healthy	41	82%
2	Serous dis	6	12%
3	Pus dis.	3	6%

On post operative day 5, wound status of 82% cases was healthy, 12% cases had serous discharge and only 6% cases had pus discharge present from the wound.

Table 4: Post operative wound status of control group on post op. Day – 05

S. No.	Day 5	No.	Percentage
1	Healthy	36	72%
2	Serous dis	10	20%
3	Pus dis.	4	8%

On post operative day 5, wound status of 72% controls was healthy, 20% controls had serous discharge and 8% controls had pus discharge present from the wound. The post operative wound status on day – 5 among both cases and controls was compared using chi-square test. The chi-square statistic is 1.4675. The p-value is 0.832377. The result is statistically not significant.

Table 5: Post operative wound status in case group on post operative day – 07

S. No.	Day 7	No.	Percentage
1	Healthy	43	86%
2	Serous dis	4	8%
3	Pus dis.	3	6%

On post operative day 7, wound status of 86% cases was healthy, 8% cases had serous discharge and only 6% cases had pus discharge present from the wound.

Table 6: Post op. wound status in control group Day - 07

S. No.	Day 7	No.	Percentage
1	Healthy	28	56%
2	Serous dis	03	06%
3	Pus dis.	19	38%

On post operative day 7, wound status of 56% controls was healthy, 6% controls had serous discharge and 38% controls had pus discharge present from the wound. The post operative wound status on day – 7 among both cases and controls was compared using chi-square test. The chi-square statistic is 36.4104. The p-value is < 0.00001. The result is statistically significant.

Discussion

SSI is one of the most common complexities following a medical procedure [7]. SSI is apparently the third most usually revealed nosocomial contamination and records for 14-16% of every nosocomial disease. Danger of SSI has been portrayed to be around 2.6% in all tasks and SSI rates are probably going to be more noteworthy than revealed since all careful injuries are sullied by climatic microscopic organisms however a couple really create clinical contamination[8,9]. An investigation was completed in Italy to discover the frequency of SSI by and large medical procedure, where 3,066 surgeries were done in 2,972 patients and 154 (5%) of them created SSI. SSI likewise influences 2.6% of patients going through thyroid medical procedure [10]. Bickel considered 210 patients who went through open a medical procedure for an infected appendix furthermore, revealed SSI in 5.6% cases. Velezquez considered 80 patients who went through open cholecystectomy and discovered SSI in 11.25% cases. SSI has been cut down significantly by utilizing different aseptic measures notwithstanding the utilization of prophylactic fundamental anti-infection agents[11,12]. Anyway the rate has been static in the course of recent many years.

Surgical prophylaxis of antibiotics is used to achieve an optimum concentration at the surgical site during the surgery which is the point of entry of pathogens. The prophylaxis immediately destroys the pathogens that enter from the incision site thereby reducing the chances of infections. However the killing effects of antibiotics is only achieved if adequate concentrations are achieved at the surgical wound site. Intravenous drug is distributed evenly in the body and hence the surface concentration at wound is very less as compared to local infiltration at the surgical wound site. Local infiltrations can give a very high local concentration of antibiotics without having to cross the safe dose limit. Information from the National Nosocomial Infections Surveillance System uncovers that the most widely recognized SSI microorganisms are Staphylococcus aureus, Enterococcus, coagulase negative Staphylococcus, Entero-bacteriaceae, Pseudomonas species.

In the present study the maximum number of patients was found in the age group of 21-30 years. A study by ***Singh A et al*** had maximum number of patient in the age group of 40 - 60 years. The variation in the age group can be attributed to demographic characteristics of the region. [13]Male preponderance was seen in the present study with males constituting 84% of the total patients while only 16% were females. **Singh A *et al*** study had 86 male participants and 34 female participants. [13] The ratio tending more towards male is probably due to males being more involved in outdoor activities and hence prone to diseases.

Majority of participants in this study had no prior co-morbidities. Only 25% of the total patients had co-morbidities like diabetes,

hypertension or obesity. Co-morbidities can affect immunity and thereby wound healing process. Obesity may cause decrease in local concentration of antibiotic if given intravenously. However the assessment of co-morbidities on SSI and healing needs further work up.

Small bowel content was most commonly encountered intra-operatively with 34% in cases and 30 % in control group respectively. This was followed by pyoperitoneum, bilious content and others. The findings suggest that most commonly involved site in spontaneous perforation is small bowel. A study by **Anand S. *et al*** had maximum patients of appendicectomy followed by peptic perforation, trauma and enteric perforation.[14] This difference may be due to variations in age, sex and region of the participants of both studies.

The most common procedure done among all the patients was primary repair of the perforation site which was in 23% of total patients. The next commonly performed procedure was primary repair with proximal stoma followed by Grahm's patch repair, resection and stoma formation, resection and anastomosis and others. The primary repair done in majority of perforations is suggestive that the bowel was healthy intra-operatively and indicates an early time of presentation to the hospital.

Fever was most commonly encountered post operative complications. Early post-operative fever can be due to inflammatory response of body to tissue damage and exposure to foreign substances during surgery. Such a fever requires no work up. Late onset fever may be due to SSI and requires thorough work up to exclude any.

The wound status among cases and controls were compared on post operative day 3, 5 and 7. At post operative day 3, among the cases, 92% had healthy wound, 6% had serous discharge and 2% had pus discharge from the surgical wound. In the control group, 80% had healthy wound, 12% developed serous discharge and 8% had pus formation at the incision site. When this data was analyzed and compared the results were not significant statistically with *p-value* of 0.329.At post operative day 5, in the cases group, 82% wounds were still healthy, 12% developed serous discharge and 6% had pus discharge while in control group 72% had healthy wound, 20% developed serous discharge and 8% had pus formation at the incision site. This result was also not significant statistically with a *p-value* of 0.832.

The wound status on post operative day 7 shows that 8% of cases had serous discharge compared to 6% of controls and 6% of cases had pus discharge compared to 38% of controls had pus discharge from incision site. The data clearly indicate the ability of intra-incisional antibiotics to reduce the incidences of SSI. The result was also statistically significant with a *p-value* of <0.00001.

A study by **Dogra *et al*** involved comparison between antibiotic infiltration and prophylactic intravenous antibiotics for reducing surgical site infections. The antibiotic used was 1gm of cefotaxime. The study reported an incidence of 10% of SSI in the patients who were given infiltrations of antibiotic at the incision site while those given intravenous antibiotic had the incidence of 18% of SSI. The data can be said to be similar to the current study.

Pollock *et al* conducted a study in 1989, where they compared the incidence of SSI after injection 1gm of amoxicillin/clavulanic acid instead of ceftriaxone at the surgical site versus intravenous prophylaxis. They found that the rate of SSI was 15.9% in those receiving intravenous antibiotics and 8.4% in that receiving intraincisional antibiotic. The result was also significant. {15]

A similar study by **Taylor *et al*** on 181 patients involved intraincisional infiltration of cefoxitin versus prophylactic intravenous administration. The rate of SSI was lower in the intraincisional group which was 4.39% while that in the prophylactic intravenous group was 16.6%. The result was significant at a p-value of 0.007. [16]

As evident from the above data and the studies compared, the rate of SSI that was reduced due to local infiltration of antibiotic with intravenous antibiotic as compared to intravenous antibiotics alone (6% versus 38%). However one should never neglect the importance of surgical etiquettes, maintaining asepsis in operation theatres, good surgical technique and quality post operative care to reduce the incidence of SSI.

Overall, this study suggests that intra-incisional with intravenous antibiotic infiltration reduces the rates of SSI in delayed post operative period. However the same cannot be said for the early post operative period as the results were not statistically significant during post operative day 3 or post operative day 5.

Conclusion

Both intra-incisional and intravenous ceftriaxone preoperatively as compared to the patients that received just intravenous ceftriaxone. The result is not significant during the early post operative period at day 3 and day 5. But the significant In our study there was significant decrease in occurrence of SSI among the patients result at day 7 is suggestive that intra-incisional with intravenous ceftriaxone prophylaxis is more effective than intravenous ceftriaxone alone for reducing SSI. Preoperative intra incisional antibiotics decreases the pace of SSI on account of the higher concentrations attained at the entry point site.

Acknowledgements

Authors would like to thank our patients who participated in our study. Also authors thankful to our colleagues, seniors and paramedical staff who helped and supported us throughout the study our colleagues, seniors and paramedical staff who helped and supported us throughout the study.

References

1. Centers for Disease Control and Prevantion. National Nosocomial infections SurveillanCenters for Disease Control and Prevention. National Nosocomial Infce (NNIS) report, data summary from October1986-April1996, issued May1996. Are port from the National Nosocomial Infections Surveillance (NNIS)System. AmJ Infect Control.1996;24:380-8.
2. Daniel AA, Dellinger EP. Surgical infections and choice of antibiotics. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, (eds). Sabiston Textbook of Surgery.18th Ed. Philadelphia: Elsevier, 2008, 229-306.
3. Burdon DW. Principles of antimicrobial prophylaxis. World j Surj. 1980; 4:433-7
4. Moylan JA. The proper use of local antimicrobial agents in wounds. World J Surg. 1980;4:433-7.
5. Davidson AIG, Clark G, Smith G. Postoperative wound infection: a computer analysis. Br J Surg. 1971;58:333-7.
6. MatushekKJ, Rosin E. Pharmacokinetics of cefazolinapplied topically to the surgical wound. Arch Surg. 1991;126:890-3.
7. khan SA, Rao PGM, Rao A, Rodgrigues G.Survey and evaluation of antibiotic prophylaxis uses in surgery wards of tertiary level institution before and after implementation of clinical guidelines . Indian.J Surg. 2006; 68:150-15
8. Barie PS,Eachempati SR.Surgical site infections.Surge Clin N Am. 2005; 85:1115-1135.
9. Coskum H, Erisen L,Basut O. Factors affecting wound infection ratrs in head and neck surg. 2000; 123:328-333.
10. Andersen BR,Kallehave FL, Andersen HK. Antibiotics versus placebo for prevention of postoperative infection after appendectomy .Cochrane Database Syst Rev. 2005;(3):CD001439.
11. Melcher GA, Ruedi TP. Duration of antibiotic treatment in surgical infections of the abdomen. Blunt abdominal trauma. Eur J Surg Suppl. 1996; 576:59-60.

12. Kanazawa H, Nagino M, Kamiya S, Komatsu S, Mayumi T, Takagi K et al. Synbioticsre duce postoperative infectious complications: a randomized controlled trail in biliary cancer patients undergoing hepatectomy. Langenbecks Arch Surg. 2005; 390:104-113
13. Anoop Singh, MahammadSalim, Bhal Singh, Akshita, A Comperative study study of preoperative intra incisional infiltration of ceftriaxone vs. intra venous ceftriaxone for prevention of Surgical Site Infection IntSurg J. 2019;6(5);1686-1692
14. Anand S, Batra R, Arora B et al. A comparative study of preoperative intra-incisional infiltration of ceftriaxone vs. intravenous ceftriaxone for prevention of surgical site infections in emergency cases. J. Evolution Med. Dent. Sci. 2016;5(64):4537-4541, DOI:10.14260/jemds/2016/1036.
15. Pollock AV, Evans M, Smith GM. Preincisionalintraparietal Augmentin in abdominal operations. Ann R CollSurg Eng. 1989;71:97-100.
16. Taylor TV, Walkar WS, Mason RC, Richmond J, Lee D. Preoperative intraparital (intra-incisional) cefooxitin in abdominal surgery. Br J Surg. 1982; 69(8):461-2.

Conflict of Interest: Nil
Source of support:Nil