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Methods: This longitudinal study was performed between November 2016 to June 2021 at Orthocare accident hospital & research center, India. Patients were allocated in two groups. Patients in Group A(n=221) were those who have received oral Amoxicillin & Clavulanic acid for 7 days as per standard protocol²¹ and Group B (n = 189) patients did not receive antibiotics as per protocol in previous studies¹⁷. Infection rate was measured in both group & measured outcome was analyzed with SPSS version 20, IBM. Categorical data was presented as percentages and analyzed with Chi square or Fisher Exact test.

Keywords: wound infection, antibiotic prophylaxis, lacerated wounds, contaminated wounds, wound length, wound debridement, copious irrigation.

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Are Prophylactic Antibiotics Necessary in Primarily Closed Lacerated Wounds?

Dr. Faheem Quraishi ^α, Dr. Iram Quraishi ^ο, Dr. A.G. Quraishi ^ρ & Dr. Kashif Momin ^ω

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Methods: This longitudinal study was performed between November 2016 to June 2021 at Orthocare accident hospital & research center, India. Patients were allocated in two groups. Patients in Group A (n=221) were those who have received oral Amoxicillin & Clavulanic acid for 7 days as per standard protocol²¹ and Group B (n = 189) patients did not receive antibiotics as per protocol in previous studies¹⁷. Infection rate was measured in both group & measured outcome was analyzed with SPSS version 20, IBM. Categorical data was presented as percentages and analyzed with Chi square or Fisher Exact test. Quantitative data was presented as Mean & Median, range wherever applicable, and analyzed using student's t test or Mann Whitney U test.

Results: We found no significant difference in infection rate between Group A (2 out of 221) & group B (1 out of 189 patients), $p < 0.05$.

Conclusion: This study shows that prophylactic antibiotic doesn't prevent infection in lacerated wounds sutured primarily, even if wounds are contaminated. Copious irrigation & meticulous debridement remain more crucial than antibiotics in preventing wound infection. Wound length & depth also doesn't correlate with wound infection.

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I. INTRODUCTION

Traumatic Lacerated wounds are routinely managed in emergency department on day care basis. The main aim of the treating surgeon is to achieve aesthetic & fast healing of wounds. Wound infection remains a major threat not only to this outcome but also adds significant morbidity. It has been prevented for ages by copious irrigation, good wound debridement and antibiotic administration¹.

Wound irrigation washes out debris & dilutes bacterial load. Irrigation has no proven effect on wound healing & infection but most of the studies support it. Instead, several RCT's prefer tap water over sterile saline for irrigation^{23,4,5,6}. Wheeler et al recommended 50 to 100 ml of irrigation solution per centimeter of wound to bring bacterial load below acceptable 10^5 organism per ml⁷. Also use of clean non sterile gloves instead of sterile gloves has hardly found to have any effect on wound infection⁸.

Surgical debridement should aim at removal of debris and contaminants and excision of dead tissues. Debridement should be done in moderation. It should serve its very purpose but also should not devitalize skin and hamper functionality.

By and large, antibiotics take the maximum attention of treating surgeon. Though, Antibiotic prophylaxis guidelines exist depending on the contamination of wound, mechanism of injury, infection potential & host predisposition⁹. There is a tendency to prescribe antibiotics fearing infection in almost all types of lacerated wounds. This overt use of antibiotics gives rise to bacterial resistance & adds to the cost of patient. In presence of contradictory studies, how far prophylactic antibiotics really benefit in lacerated wounds is unclear^{10,11,12}.

Many studies evaluated role of prophylactic antibiotics in preventing surgical site infection. But very few evaluated use of prophylactic antibiotic in preventing wound infection after suturing of simple contaminated lacerations^{13,14,15,16}. In 1997 Cassell et al concluded that antibiotics were unnecessary for sharp upper limb lacerations, provided good surgical debridement is done¹⁷. Taking his observation further, the objective of present study was to find if antibiotics really benefit in preventing infection in lacerations anywhere in body, provided copious irrigation & meticulous surgical debridement is performed. Also, when wounds are contaminated.

II. MATERIAL & METHODS

a) Study

This was a longitudinal study to compare outcomes of two groups of patients with lacerated wound sutured primarily treated with & without prophylactic antibiotic. This study was performed between November 2016 to June 2021 at Orthocare

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accident hospital & research center located in Manmad, India.

b) Patients

Patients attending emergency department lacerated wounds were registered for the study after obtaining their informed consent. Patients were allocated in two groups. Patients in Group A were those who have received oral Amoxicillin & Clavulanic acid for 7 days as per standard protocol²¹ and Group B patients did not receive antibiotics as per previous studies.¹⁷

c) Inclusion criteria

All Patients with lacerated wounds presenting within 6 hours of injury that needed primary closure located anywhere in the body were included in the study. All types of simple & contaminated wounds except gunshot wounds were included. These wounds included superficial and deep wounds exposing muscles, tendons and bones.

d) Exclusion criteria

All patients with co-morbidities like Diabetes, Hypothyroidism, Renal or Hepatic disorders, Cancer, Rheumatoid arthritis and on steroids or DMARD's were excluded from study. Patients presenting more than 6 hours after injury and patients with grossly contaminated wounds where contaminants were embedded in soft tissues & couldn't be debrided thoroughly were also excluded. Also sewage contaminated wounds were excluded. Wounds extending to joints, having underlying fracture, nerve or vascular injury were also excluded. Patient who did suture removal at other hospitals were also excluded from study.

e) Treatment protocol

All patients were treated at presentation in Minor Operation Theatre in Emergency Department. No prophylactic antibiotic before suturing was given & all wounds were anesthetized with 1% Xylocaine local infiltration. All wounds were irrigated with normal saline. Wounds less than 5cm were irrigated with 100ml & wounds more than 5cm were irrigated with 500ml of normal saline respectively. No Povidine iodine solution, Hydrogen peroxide, Spirit or other antiseptic solution were used for wound wash or in wound preparation. Wound closure was done using sterile gloves & draped with sterile hole sheets. Skin closure was done with Nylon & Vicryl was used for subcutaneous closure if required. Dressings were done with sterile gauzes & povidone iodine ointment. Wound dressings were done on day 3 and 7 provided blood soakage was not there. Patients were cautioned against signs of infection like erythema, fever, purulent discharge, foul smell, sudden increase in pain & were advised to report to hospital immediately. Facial wound sutures were removed between day 5-7, elsewhere in body suture removal was done between 10-14 days. In case if infection ensued in Group A (patients on prophylactic oral Amoxycillin &

Clavulanic acid) oral Linezolid was given for 7 days. Whereas, if infection occurred in Group B (patients not on any prophylactic antibiotic) oral Amoxicillin & Clavulanic acid were given for 7 days.

f) Data Collection & Statistical analysis

Suturing & Group allotment was done by orthopedic surgeon of the hospital. Suture removal was done by maxillofacial surgeon & medical officer of hospital. Outcomes were recorded by maxillofacial surgeon of hospital. Data was recorded in excel sheet & outcome was analyzed with SPSS version 20, IBM. Categorical data was presented as percentages and analyzed with Chi square or Fisher Exact test. Quantitative data was presented as Mean & Median, range wherever applicable, and analyzed using student's t test or Mann Whitney U test.

III. RESULTS

During the study duration 653 patients were treated for lacerated wounds. 410 Patients were included in study, of which 308 were male & 102 were female. 221 patients received antibiotics & were included in group A. 189 didn't receive antibiotics in any form hence were included in group B. The average age of patient in group A was 29.10 years with a range 1.5 to 90 years & in group B average age was 29.13 years with a range 2 to 81 years (Table 1).

Since our study included lacerations all around body 81 (group A 44, group B 37) lacerated wounds were located on upper limbs, 105 (group A 57, group B 48) on lower limbs, 221 (group A 119, group B 102) on head & neck & 3 (group A 1, group B 2) on trunk. The average length of wound was 5.1cm (group A 5.5cm, group B 4.7cm) with a range of 1.5 to 26 cm (group A 1.5cm to 26cm, group B 1.5cm to 18cm). (Table 2)

Total 2 patients from group A developed infection & 1 patient from group B developed infection (Table 3). Out of these, one infected patient of Group A was a 63 years old female who had sustained wound over anterior aspect of left knee measuring 10 cm after Road traffic accident. 2nd infected patient from Group A was 35 years old male who sustained 7cm laceration over left palmar aspect of hand from dough machine. Both patients were put on oral Linezolid & wound debridement was done. It took 4 weeks for complete healing of wounds. Single patient infected of Group B was a 21 years old male with 6cm laceration over dorsal foot. This patient was put on oral Amoxycillin & Clavulanic acid & wound debridement was done. Wound healed in 24 days completely. All infected wounds healed with no disability except scarring. (Table 4)

We found no significant difference in infection rate between Group A (2 out of 221) & group B (1 out of 189 patients), $p < 0.05$ (Table 3).

Table 1: Gender & Age distribution of patients

Category	Male No (%)	Female No (%)	Age range & Median
Group A	165(74.66)	56(25.34)	1.5 to 90 years(32 years)
Group B	143(75.66)	46(24.34)	2 to 81 years(38 years)
Total	308(75.16)	102(24.84)	1.5 to 90 years(35 years)

Table 2: Anatomical distribution & length of wounds

Category	Upper limb No (%)	Lower limb No (%)	Head & neck No (%)	Trunk No (%)	Range & Mean Length
Group A	44(19.90)	57(25.79)	119(53.85)	1(0.46)	1.5 to 26cm (5.5cm)
Group B	37(19.6)	48(25.40)	102(54)	2(1)	1.5 to 18cm (4.7cm)
Total	81(19.76)	105(25.61)	221(53.9)	3(0.73)	1.5 to 26 cm (5.1cm)

Table 3: Infection rate in patients

Category	Infected No (%)	Un-infected No (%)
Group A	2(0.9)	219(99.1)
Group B	1(0.5)	188(99.5)
Total	3(0.73)	407(99.27)

Fisher Exact Test, $p=1$. The result was not significant, $p<0.05$

Table 4: Details of infected patients

Patient	Group allotted	Age	Sex	Mode of injury	Location	Length (cm)	Final outcome
1.	A	63	female	Road traffic accident	Knee	10	Healed with scarring
2.	A	35	Male	Dough machine	Hand	7	Healed with scarring
3.	B	21	Male	Road traffic accident	Foot	6	Healed with scarring

IV. DISCUSSION

With the proven usefulness of prophylactic antibiotic in preventing surgical site infection, a general consensus started to grow that prophylactic antibiotic have same effect in preventing infection in sutured lacerated wounds. Eventually the focus of treating surgeon started shifting from essential measures like debridement & wound irrigation to antibiotics. It was followed by overt antibiotic usage for sutured wound & still higher antibiotics for various surgical procedures. Then studies started evaluating usefulness of one prophylactic antibiotic over the other. With passing years antibiotics usage completely overshadowed the basic principles of preventing wound infection in sutured wounds.

The intention of the study was to allay apprehension of treating surgeon about wound infection and to bring into notice real measures effective in preventing wound infection. This study evaluated whether prophylactic antibiotic usage was prudent for preventing infection in primarily closed lacerated

wounds. It also emphasized how effective debridement & wound irrigation are in preventing infection.

The study showed in spite of giving antibiotics in effective doses there was no clinically significant benefit of prophylactic antibiotic in lacerated wounds, even contaminated wounds. This was also supported by multiple studies & meta analysis^{18-19,20}. In fact, there are added problems with overt antibiotic usage. It adds to development of bacterial resistance, chances of developing allergic reaction & adds to the financial burden of patient.^{21,22,23,24} Antibiotic usage must be tailored as per degree of bacterial contamination, type of contaminants like sewage water & host vulnerability factors for infection.

Wound debridement is most essential in preventing wound infection, it removes all dead tissues that act as a good medium for bacterial growth^{25,26}, so was emphasized in current study. All wounds were thoroughly debrided by qualified & experienced surgeons. Probably this crucial factor helped preventing wound infection in all the wounds in this study also. Wound irrigation is also effective in preventing infection. It dilutes the bacterial load of wound & washes out

debris, clots & contaminants. It should always be accompanied by good debridement to get optimum results.

Another consensus has been longer the wounds more chances of infection. W.H.O. (World Health Organisation) also recommends antibiotic prophylaxis for wounds longer than 5cm considering increased chances of infections²⁷. Though, in current study all infected wounds were greater than 5cm. The correlation between wound length & infection didn't prove significant as many lacerations longer than the infected ones healed uneventfully. Also wound depth didn't affect the outcome. No correlation was found between wound depth & incidence of infection.

Holistically, prophylactic antibiotic usage doesn't allow treating surgeon overlook good wound debridement & irrigation. Infact prophylactic antibiotic usage has no bearing in preventing wound infection if good debridement & copious irrigation is done. Length & depth of wound also appears not to affect incidence of wound infection.

V. CONCLUSION

This study shows that prophylactic antibiotic doesn't prevent infection in lacerated wounds sutured primarily, even if wounds are contaminated. Copious irrigation & meticulous debridement remain more crucial than antibiotics in preventing wound infection. Wound length & depth also doesn't correlate with wound infection.

Hence, treating surgeon should concentrate on copious irrigation & meticulous debridement rather than relying on prophylactic antibiotics for preventing wound infection.

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Conflict of interest

Authors express no conflict of interest.

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