

Topical L -Lysine's efficacy in superficial surgical site infections

Dr. Tanusree Burmon¹, Dr. Mahbuba Akhter², Dr. A. K. M. Lutful Haque³, Dr. Md. Mohiuddin Biswas⁴, Dr. Md. Saba Al Galib⁵

¹Assistant Professor, Department of Surgery, Kurmitola General Hospital, Dhaka, Bangladesh.

²Junior Consultant, Department of Surgery, Casualty Block, Dhaka Medical College Hospital, Dhaka, Bangladesh.

³Registrar, Department of Surgery, Kurmitola General Hospital, Dhaka, Bangladesh.

⁴Resident Surgeon, Department of Surgery, Kurmitola General Hospital, Dhaka, Bangladesh.

⁵Junior Consultant, Department of Surgery, 250 Beded General Hospital, Joypurhat, Bangladesh.

Corresponding Author: Dr. Tanusree Burmon, Assistant Professor, Department of Surgery, Kurmitola General Hospital, Dhaka, Bangladesh.

Abstract

Background: L-Lysine is an essential amino acid, meaning that humans cannot produce it. It has been found to stimulate therapeutic angiogenesis in wound healing.

Aim of the study: Given the scarcity of research on the efficacy of topical L-Lysine in superficial surgical site infections, the current study was designed to analyze the efficacy of topical L-Lysine in the treatment of superficial surgical site infections.

Methods: Following ethical approval, this observational study was conducted for six months at the Department of Surgery, Sir Salimullah Medical College, and Mitford Hospital in Dhaka. Patients who had superficial surgical site infections after surgery were included in the study. After screening, 200 patients were included. The topical drug (L-lysine HCL 15% gel) was used after dressing. All patients were followed for a maximum of two weeks. The data were collected using a case record form. Data on the patient's demographic profile, granulation tissue appearance, and overall outcome were collected and documented on a premade and pretested data collection sheet. The data was analyzed with SPSS (Statistical Package for Social Science) (Trail Version).

Results: The average age of the study population was 34.43±8.73, with nearly equal male and female ratios. Approximately 41% of respondents had low socioeconomic status, 27% had intermediate socioeconomic status, and 32% had high socioeconomic status. At the third post-operative day (POD) after surgery, granulation tissue had not formed in 86% (n=172) of the cases and had only partially formed in 14% (n=28). All of them received a thick layer of L-lysine, and on the eighth postoperative day, 92% (n=184) had produced partial granulation tissue, while 3% (n=6) had reached complete healing. The study found that 91% were satisfied, 4% were very satisfied, and the remainder were unsatisfied with the effect of L-lysine.

Conclusion: The use of L-lysine resulted in a significant improvement in superficial surgical site infection. L-lysine shortens the time it takes for granulation tissue to form. However, additional clinical trials are recommended.

Keywords: L-lysine, essential amino acid, superficial surgical site infection.

I. INTRODUCTION

Many patients experience postoperative wound infections, often known as surgical site infections (SSIs), which hinder their rehabilitation. The Centers for Disease Control and Prevention (CDC) defines these infections as occurring within 30 days of an operation at the site or part of the body where the surgery took place, or within a year if an implant is left in place and the infection is thought to be secondary to surgery [1, 2]. Bacterial colonization on the patient's skin, alimentary and vaginal tracts are the main contributory causes that contribute to SSIs [3]. SSIs can be characterized as superficial/incisional if limited to the skin and subcutaneous tissue, deep incisional when including the fascia and muscle, or organ space when involving a bodily cavity (e.g., abdominal cavity after gastrointestinal surgery) [2,3]. Deep tissues and organ spaces SSIs are less common than superficial SSIs, but they are related with higher morbidity/mortality, readmission rates, longer hospital stays, and overall hospital-associated expenditures [4, 5]. Although the majority of SSIs are minor, some can be severe and difficult to treat, such as necrotizing deep soft tissue infections [5]. Wound infections or surgical site infections are estimated to occur after 1%-3.1% of all surgical procedures and responsible for roughly 2% of hospital-acquired infections mortality [1, 6]. In abdominal surgery, the rate of wound infection may be significantly greater, with numerous studies suggesting a 15% to 20% prevalence depending on the level of contamination [7, 8]. In

comparison to other prevalent nosocomial infections, wound infections (21.8%) and pneumonia (21.8%) were the most commonly reported, followed by gastrointestinal (17.1%), urinary tract (12.9%), and bloodstream infections [9]. An ideal wound care product should protect normal tissues while simultaneously controlling infection and without interfering with regular wound healing. Lysine is an α -amino acid with the chemical formula $\text{HO}_2\text{CCH}(\text{NH}_2)(\text{CH}_2)\text{NH}_2$. This amino acid is essential, which means that humans cannot produce it. L-Lysine has been found to stimulate therapeutic angiogenesis in wound healing [10]. Lysine-mediated angiogenesis is thought to be the outcome of the molecule serving as a cell surface bridge, binding angiogenic agents to their receptors. This aids in increasing the angiogenesis generated by the lysine molecule through the ligand receptor binding pathway. This work employed this molecule's angiogenic and tissue regeneration properties [3, 11]. Lysine is accessible in an ointment form. Lysine can be taken in the form of tablets, capsules, or liquids. Although Lysine pills are available over the counter, they should only be used during herpes outbreaks and not on a daily basis [2].

The prevalence of SSI has not been determined in Bangladesh. Furthermore, no research have been undertaken to determine the prevalence of SSI in Bangladeshi tertiary-care hospitals. Furthermore, surveillance systems are critical for determining the incidence, prevalence, and distribution of SSIs, and they produce reliable data. Active surveillance methods in wealthy countries have helped to reduce SSI rates. However, SSI surveillance systems are still underdeveloped in developing countries. Bangladesh, a developing country, lacks a surveillance mechanism for SSI in its hospitals.

II. METHODOLOGY

Following ethical approval, this observational study was conducted for six months at the Department of Surgery, Sir Salimullah Medical College, and Mitford Hospital in Dhaka. Patients who had superficial surgical site infections after surgery were included in the study. After screening, 200 patients were included. The topical drug (L-lysine HCL 15% gel) was used after dressing. All patients were followed for a maximum of two weeks. The data were collected using a case record form. Data on the patient's demographic profile, granulation tissue appearance, and overall outcome were collected and documented on a premade and pretested data collection sheet. The data was analyzed with SPSS (Statistical Package for Social Science) (Trail Version). Following data collection, entered into a spreadsheet of Microsoft Excel 2010 data entry platform. The entered data then assessed for completeness, accuracy and consistency before analysis was commenced. Data analysis was carried out by using SPSS version 22. Exploratory data analysis was carried out to describe the study population where categorical variables were summarized using frequency tables while continuous variables were summarized using measures of central tendency and dispersion such as mean, median, percentiles and standard deviation. In order to determine associations chi squared tests was used. In each analysis, p values <0.05 were considered statistically significant.

Inclusion criteria:

- Patients above 18 years of both sexes
- Post-operative superficial surgical site infection

Exclusion criteria:

- Deep/complete wound dehiscence
- Patients associated with comorbid disease e. g. Diabetes mellitus, Malignancy, Chronic renal disease, chronic pulmonary disease
- Patients taking anticancer drugs, Steroids

Criteria of SSI applying L- Lysine ointment:

- Superficial surgical site infections discharging pus or infected serous fluid.
- Poorly developed granulation tissue.
- Efficacy is studied in terms of: Duration of healing time.

III. RESULT

Table-1 shows the average age of the study population was 34.43 ± 8.73 , with nearly equal male and female ratios. Approximately 41% of respondents had low socioeconomic status, 27% had intermediate socioeconomic status, and 32% had high socioeconomic status. Table-2 shows 43.5% undergoes laparotomy, 22% undergoes Appendectomy, 20% undergoes hernioplasty, 12.5% had breast surgery and 2% had pancreatic operation. Table-3 shows duration of the surgery was more than 2 hours in 70.5% cases and 29.5% was less than 2 hours. Table-4 shows during post-operative follow up, total 200 patients were identified with superficial surgical site infection. Among them, 86% respondent's granulation tissue was not formed in 3rd day of surgery and 14% respondent's granulation tissue was partially formed within 3rd day of surgery. Table-5 shows at 8th day of surgery 92% respondent's granulation tissue was partially formed; 5% respondent's granulation tissue was not formed

and 3% respondent's granulation tissue was fully formed. Table-6 shows that 91% was satisfied, 4% were very satisfied about the effect of L-lysine. Besides this only 4% was dissatisfied and 1% said average about effect of L-lysine.

Table-1: Distribution of the respondents by sociodemographic profile (N=200)

Sociodemographic profile	Frequency (n)	Percentage (%)
Age (years)		
20 to 32 years	95	47.5
33 to 43 years	57	28.5
44 to 54 years	45	22.5
55 to 65 years	2	1.0
above 65 years	1	.5
Mean±SD	34.43±8.73	
Sex		
Male	101	50.5
Female	99	49.5
Economic status		
Low socioeconomic (less than 15000 taka)	81	40.5
Middle socioeconomic (15000 to 25000 taka)	55	27.5
Highly socioeconomic (above 25000 taka)	64	32

Table -2: Distribution of the respondents by superficial SSI by specific procedure (N=200)

Specific procedure	Frequency (n)	Percentage (%)
Laparotomy	87	43.5
Appendicectomy	44	22
Hernioplasty	40	20
Breast surgery	25	12.5
Pancreatic operation	4	2
Total	200	100

Table-3: Distribution of the respondents by duration of the surgery (N=200)

Duration	Frequency (n)	Percentage (%)
<2 hour	59	29.5
>2 hour	141	70.5
Total	200	100

Table-4: Distribution of the respondents by granulation tissue formation at 3rd day of surgery (N=200)

Granulation tissue formation	Frequency (n)	Percentage (%)
Partially formation	28	14
No formation	172	86
Total	200	100

Table-5: Distribution of the respondents by granulation tissue formation at 8th day of surgery (N=200)

Granulation tissue formation	Frequency (n)	Percentage (%)
Partially formation	184	92
No formation	10	5
Full formation	6	3
Total	200	100

Table-6: Distribution of the respondents by satisfaction level of using L-lysine (N=200)

Satisfaction level	Frequency (n)	Percentage (%)
Dissatisfied	8	4
Average	2	1
Satisfied	182	91
very satisfied	8	4
Total	200	100

IV. DISCUSSION

Skin is a natural barrier to infection, thus any surgery that causes a break in the skin can result in a postoperative infection. A surgical site infection (SSI) is an infection that develops after surgery in the area of the body where the procedure was performed. Surgical site infections can occasionally be superficial, affecting merely the skin. Surgical site infections (SSI) refer to all postoperative surgical infections that arise at the operative site. Superficial incisional surgical site infection develops within 30 days following the operation, affecting only the skin or subcutaneous tissue of the incision and posing a significant illness burden for patients and healthcare providers. Lysine is an essential cationic amino acid that plays a role in cellular proliferation in vitro (both anchorage dependent and anchorage independent) and in vivo, as well as the ability to induce strong inflammatory and immune responses - both humoral and cell mediated - and the role in augmented healing of all types of wounds in animal models and human subjects (acute and chronic) [10]. This was an observational study conducted at the Surgery Department of Sir Salimullah Medical College and Mitford Hospital in Dhaka. 47.5% of respondents were between the ages of 20 and 32, 28.5% were 44 to 54 years old, 22.5% were 33 to 43 years old, 1% were 55 to 65 years old, and just 0.5 were over the age of 65. The average age of the responders was 34.43 ± 8.73 years. 50.5% of responders were men, while 49.5% were women. In a prior study, there were 607 patients with a mean age of 45 years, and 53% of them were male [12]. Another study found that the average age of the patients in the study was 44.69 (SD=19.16), with more than half (68.4%) being male [13]. In this study, 24% underwent bowel surgery, 22% underwent appendectomy, 19% underwent laparotomy, 12% underwent breast surgery, 20% underwent hernioplasty, and 2% had pancreatic surgery. In a prior investigation, H. Sickder et al. discovered 170 SSI over the study period. Another study found that superficial surgical site infection (SSI) is prevalent following appendectomy, especially in severe appendicitis [12]. In this study, 29.5% of the surgeries lasted more than 2 hours, whereas 70.5% took less than 2 hours. Long-term surgery has been shown to increase the risk of infection. Similar findings were seen in a prior investigation, when 80.8% of the isolates came from procedures lasting more than 2 hours and 19.2% from surgeries lasting less than 2 hours [14]. Another study found that operational time above 75 minutes was strongly linked with superficial SSI following open appendectomy [12]. In this study, 37.5% of respondents stayed in the hospital for 3 to 5 days after surgery, 38% for 6 to 10 days, and 24.5% for 11 to 15 days. Another study found that SSIs prolong hospitalization. Each SSI results in more than one week of extended postoperative hospital stay [4]. Another study found that individuals with SSI had a 3.61-day longer average postoperative stay than those without SSI (11.53 days vs. 7.92 days) [15]. At the eighth day of surgery 92% of respondents' granulation tissue was partially developed; 5% of respondents' granulation tissue was not formed; and 3% of respondents' granulation tissue was fully formed on the thirteenth day of surgery. In this study, 91% were satisfied and 4% were extremely satisfied with the effect of L-lysine. Aside from that, just 4% were unsatisfied with the effect of L-lysine, with 1% rating it as average. Overall, 91.5 percent of respondents were satisfied with the use of L-lysine.

Limitation of the study:

This was a single-centered study with a modest sample size. As a result, the study's conclusions may not accurately reflect the situation throughout the country.

V. CONCLUSION & RECOMMENDATION

The use of L-lysine significantly reduced superficial surgical site infection. L-lysine reduces the time it takes for granulation tissue to develop. However, more clinical trials are recommended.

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