

Healing of Postsurgical Wound in the Maxillofacial Region: The Role of Exposure Time

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ABSTRACT

Background: Although the maxillofacial region is very rich in blood supply, surgical wounds in this region are also prone to infection, if good aseptic techniques are not strictly followed. There is a need to evaluate healing of surgical wound following the removal of wound dressing at different days postoperative in the maxillofacial region. This paper describes and compares healing in terms day of exposing a clean surgical wound. **Objective:** To evaluate healing of surgical wound following the removal of wound dressing at different days postoperative in the maxillofacial region. **Materials and Methods:** One hundred and fifteen patients who met inclusion criteria, admitted for surgeries in maxillofacial regions were randomly grouped into one of the five surgical dressing options. ASEPSIS wound scoring system was used for the study. All patients were monitored for a period of 7 days when wound healing and suture removal is expected to take place uneventfully. Chi-square, Fisher's exact, and nonparametric Kruskal–Wallis tests as appropriate. Statistical significance was set at $P < 0.05$. **Results:** There was no difference in healing between males and females ($\chi^2 = 2.832$, $df = 4$, $P = 0.586$). There was no significant difference in healing within the different days of exposure of the wound ($\chi^2 = 8.479$, $df = 4$, $P = 0.076$). **Conclusion:** Early exposure of surgically clean wounds does not impair healing.

Key words: ASEPSIS, healing, infection, wound

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INTRODUCTION

Wound is defined as injury to any of the tissues of the body caused by physical means and leading to interruption of continuity.¹ Wounds can be classified as clean, clean contaminated, contaminated, and infected. Ignaz Semmelweis and Joseph Lister who introduced antiseptic surgery were the pioneers of infection control. Most wounds were infected and resulted in a mortality rate of 70–80%.² Since then, a number of significant developments, particularly in the field of microbiology, have made surgery safer. However, the overall incidence of healthcare associated infections remains high and represents a substantial burden of disease. Wound edges are brought together at about 4–6 days, before granulation tissue is visible.³

The level of bacterial burden is the most significant risk factor,⁴⁻⁶ but modern surgical techniques and the use of prophylactic antibiotics have reduced this risk. Infection rates in the four surgical classifications (clean, clean-contaminated,

contaminated, and dirty wounds) have been published in many studies, but most literature refers to the work of Cruse and Foord as a benchmark for infection rates.^{5,6} Before the routine use of prophylactic antibiotics, infection rates were 1–2% or less for clean wounds, 6–9% for clean-contaminated wounds, 13–20% for contaminated wounds, and about 40% for dirty wounds.^{5,6} Since the introduction of routine prophylactic antibiotic use, infection rates in the most contaminated groups have reduced drastically. Infection rates in the USA National Nosocomial Infection Surveillance system hospitals were reported to be: Clean 2.1%, clean-contaminated 3.3%, contaminated 6.4%, and dirty 7.1%.⁷ There is, however, a considerable variation in each class according to the type of surgery being performed.⁸ Postoperative wound should be free of exudates and accurate skin apposition and should be well-vascularized to achieve ealing.⁹ In the management of surgical wound, a surgeon may apply dressing with gauze until the sutures are removed and

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healing has taken place, in this method, there may chance of growth of bacteria underneath of dressing. Besides increasing the rate of epithelialization of wounds, other benefits of wound dressings include protecting the wound bed from environmental toxins and microorganisms.¹⁰ In others, wound is kept open after 3rd postoperative day to get benefit of daily observation and to save dressing expense and nursing time.¹¹

Although studies in the past have shown the safety of exposure of surgical wounds, it is still common practice to dress them postoperatively. Studies have shown that wound healing involves the development of a coagulum of blood and fibrin within 2 h of closure, which is impenetrable to bacteria.^{12,13} Thus, if the wound can be kept free of bacteria until this coagulum has formed, infection is unlikely.^{14,15} In order to investigate the need for surgical dressings, a prospective study was done, using a dry dressing of gauze and exposing the wounds at different times in noncontaminated elective surgical maxillofacial wounds.

ASEPSIS tool, which was used for this study was originally intended for use in evaluating the efficacy of different antibiotic regimens by describing characteristics of abnormal wound healing.¹⁶ Although the ASEPSIS tool is primarily concerned with the assessment of healing with respect to postoperative wound infection, its ability to assess the clinical appearance of a wound warranted its inclusion in this study. ASEPSIS has been evaluated by two separate studies by Wilson *et al.*¹⁶ and Byrne *et al.*¹⁷ both demonstrating the ASEPSIS tool to have high inter-rater reliability. Several studies have used the ASEPSIS tool in the assessment of wound infection rates.^{18,19} The aim of this study is to evaluate wound healing of surgical wound following the removal of wound dressing at different days postoperative in the maxillofacial region.

MATERIALS AND METHODS

The study was conducted at the maxillofacial unit of the Department of Dental Surgery, University of Uyo Teaching Hospital, Uyo. This study included all consecutive patients who underwent maxillofacial surgery between February 2012 and October 2014. One hundred and fifteen patients who met inclusion criteria, admitted for surgeries in maxillofacial regions were randomly grouped into one of five surgical dressing options. Five patients could not be traced for follow-up after hospital discharge and were therefore excluded from the study. Hence, 110 patients who had surgeries involving the maxillofacial region were involved in the study. All surgical wounds were extra oral involving different parts of the maxillofacial region. Strict aseptic preoperative preparations and precautions were taken. Inclusion criteria include noninfective lesions, areas without scars as well as clean and clean contaminated stitched wounds. Contaminated, infected, or open wounds were excluded. Maxillofacial patients with medical conditions that could impair wound healing such as diabetes, smoking, and alcoholism were similarly excluded. In addition, patients on certain drug therapies that

increase the risk of wound healing (e.g., steroids, antineoplastic chemotherapy) were excluded. Asepsis wound scoring system was used for the study. The patients were categorized into five groups of 22 each according to the day of exposure of the wound. The scoring system chart was recorded daily for the period of stay in the hospital. All patients were monitored for a period of 7 days when wound healing and suture removal is expected to take place uneventfully.

The study was conducted in both sexes, all ages of patients, all types of the incision, and different clean surgeries. Written informed consent of patients and relatives were taken. All the patients had operations that demand hospital admission for postoperative monitoring and interrupted skin stitches were used for all the patients. At wound closure, swabs were taken for bacteriological culture, and the wound was sutured in layers, with silk suture material on the skin. Gauze dressing was applied over the wound and covered with an adhesive elastic bandage. Dressings were left intact for 1, 2, 3, 4, and 5 days intervals; then the wounds were opened and assessed at those different days. During this period, we observed for signs of wound infection such as pyrexia, local pain or soaking of dressing, serous discharge, purulent exudates, and separation of deep structures. Infected wounds were cleaned and another dressing placed. The wound was kept undressed after those time intervals till the time of stitch removal.

The ASEPSIS assessment tool [Table I] was used in the data collection. Wound infections were assessed based on ASEPSIS scoring method. ASEPSIS is a quantitative scoring method used to provide a numerical score by using objective criteria based on wound appearance and the clinical consequences of

Table I: Asepsis wound scoring system

| Wound characteristic | Proportion of wound affected | | | | | |
|----------------------------|------------------------------|-----|-------|-------|-------|-----|
| | 0 | <20 | 20-39 | 40-59 | 60-79 | >80 |
| Serous exudates | 0 | 1 | 2 | 3 | 4 | 5 |
| Erythema | 0 | 1 | 2 | 3 | 4 | 5 |
| Purulent exudates | 0 | 2 | 4 | 6 | 8 | 10 |
| Separation of deep tissues | 0 | 2 | 4 | 6 | 8 | 10 |

Points are scored for daily wound inspection

| Criterion | Points |
|---|-----------|
| Additional treatment | |
| Antibiotics | 10 |
| Drainage of pus under local anesthesia | 5 |
| Debridement of wound (general anesthesia) | 10 |
| Serous discharge* | Daily 0-5 |
| Erythema* | Daily 0-5 |
| Purulent exudate* | Daily 0-5 |
| Separation of deep tissues* | Daily 0-5 |
| Isolation of bacteria | 10 |
| Stay as inpatient prolonged over 14 days | 5 |

*Given score only on 5 of 7 days. Highest weekly score used. Category of infection - Total score 0-10: Satisfactory healing, 11-20: Disturbance of healing, 20-30: Minor wound infection, 31-40: Moderate wound infection, >40: Severe wound infection (adapted from Wilson AP *et al.*, Lancet 1986¹⁶)

the infection.²⁰ Extra points were added for antibiotic treatment of surgical site infection (10 points), drainage of pus under local anesthesia (5 points), debridement of the wound under general anesthesia (10 points), isolation of bacteria from the wound (10 points), and an inpatient stay of more than 14 days (5 points). A numerical score was calculated according to the proportion of the wound affected by each of these characteristics. The ASEPSIS scoring method classified wound severity as follows: Scores of 0–10 (satisfactory healing), 11–20 (disturbance of healing) are known to describe some infections but most reflect wound breakdown due to other causes, 21–30 (minor wound infection), 31–40 (moderate wound infection), and 40–70 (severe infections score).²¹ All data were treated, analyzed, and presented as group data.

Data analyses

Data analyses were performed using the Statistical Package for Social Sciences (version 15; SPSS Inc., Chicago, Ill, USA). Categorical variables were presented as frequency and percentages while continuous variables as mean and standard deviation. Inferential statistics was done using Chi-square, Fisher's exact, and nonparametric Kruskal–Wallis tests as appropriate. Statistical significance was set at $P < 0.05$.

RESULTS

Of the 110 patients seen, 62 (56.36%) were males whereas females accounted for 48 (43.64%). The age group of 31–40 years was also mostly involved (37.27%) with the least group being 61–70 years [Table II]. Table III showed the distribution of the score with the majority ($n = 83$; 75.45%) of the patients within satisfactory healing score (0–10). Only four patients had severe wound infection (>40). This shows that most of the wound healed satisfactorily and there was no difference in healing between males and females ($\chi^2 = 2.8$, $df = 4$, $P = 0.5$) [Table III]. Table IV shows the pattern of wound healing according to the day of wound exposure. There was no significant difference in healing within the different days of exposure of the wound ($\chi^2 = 8.479$, $df = 4$, $P = 0.076$) [Table IV]. This shows that majority of the wound healed satisfactorily irrespective of the day of exposure.

DISCUSSION

Asepsis tool was originally intended for use in evaluating the efficacy of different antibiotic regimens by describing characteristics of abnormal wound healing.¹⁶ It has the ability to assess the clinical appearance of a wound, hence its inclusion in this study. In the present study, we used the ASEPSIS scoring methods to identify the risk of infection and the appropriate scoring method that assesses the severity of wound infection.

The results of this study show that the ASEPSIS scoring method permits detection of minor changes to surgical wounds and reduces subjectivity in symptom evaluation, thereby making it a useful and valuable classification system for research and education purposes. The results indicate that healing is not impaired by exposure of “clean” postoperative

Table II: Age distribution

| Age range | Frequency ($n=110$) (%) |
|------------------|---------------------------|
| 0-10 | 5 (4.55) |
| 11-20 | 10 (9.09) |
| 21-30 | 28 (25.45) |
| 31-40 | 41 (37.27) |
| 41-50 | 16 (14.55) |
| 51-60 | 7 (6.36) |
| 61-70 | 3 (2.73) |
| Total | 110 (100) |
| Mean age (years) | 36 |

Table III: Gender distribution of category of score

| Category of score | Frequency ($n=110$) (%) | Male ($n=62$) (%) | Female ($n=48$) (%) |
|----------------------------------|---------------------------|---------------------|-----------------------|
| Satisfactory healing (0-10) | 83 (75.45) | 44 (70.97) | 39 (81.25) |
| Disturbance of healing (11-20) | 15 (13.64) | 9 (14.52) | 6 (12.5) |
| Minor wound infection (20-30) | 6 (5.45) | 4 (6.45) | 2 (4.17) |
| Moderate wound infection (30-40) | 2 (1.82) | 2 (3.23) | 0 (0) |
| Severe wound infection (>40) | 4 (3.64) | 3 (4.83) | 1 (2.08) |
| Total | 110 (100) | 62 (100) | 48 (100) |

Pearson Chi-square test: $\chi^2=2.832$, $df=4$, $P=0.586$

wounds in both covered and exposed wounds. This is in agreement with a study by Law and Ellis, who reported that the incidence of wound infection is not increased by exposure to pathogens when dressings are removed.²² The infection rate in the dressed group after some days, although not significant, is probably due to the moist environment beneath the dressing. This delays the maturation of the coagulum barrier and allows organisms on the skin to penetrate the wound. Nursing and medical care is easier with exposed wounds where the surgeon can easily observe the wound.²² In closed surgical wounds, the main function of the dressing is to absorb blood or hemerosous fluid in the immediate postoperative phase.

There are many types of dressing available for surgical wounds, and the choice is often based on cost and personal preference. The most commonly used dressings are simple, low-adherent island dressings, but care should be taken as some adhesives can cause reactions in patients with sensitive skin. Blistering may occur, if dressings are applied under tension or over a joint where the movement will cause friction between skin and dressing.²³ The choice of dressing should also be based on the patient's needs. If, for example, the patient is treated as a day case, a shower proof dressing may be most appropriate if it is required for more than 24 h. How frequently, or for how long, a surgical wound should be dressed is also a matter of personal preference. Some units leave wounds exposed from the moment of closure, others uncover them after 24 h, and others keep them dressed until complete healing has taken place and sutures/clips/staples are removed.

There is no previous evidence to support a particular regimen for incision site, but it is recommended that they are not

Table IV: Wound healing according to day of wound exposure

| Day | Satisfactory healing (score 0-10) (%) | Disturbance healing (score 11-20) (%) | Minor wound infection (score 20-30) (%) | Moderate wound infection (score 30-40) (%) | Severe wound infection (score >40) (%) | Mean* rank |
|-----|---------------------------------------|---------------------------------------|---|--|--|------------|
| 1 | 18 (81.82) | 1 (4.55) | 3 (13.63) | 0 (0) | 0 (0) | 52.34 |
| 2 | 20 (90.91) | 1 (4.55) | 1 (4.55) | 0 (0) | 0 (0) | 46.93 |
| 3 | 18 (81.82) | 2 (9.09) | 1 (4.55) | 1 (4.55) | 0 (0) | 52.05 |
| 4 | 12 (54.55) | 8 (36.36) | 1 (4.55) | 0 (0) | 1 (4.55) | 65.55 |
| 5 | 15 (68.18) | 3 (13.64) | 0 (0) | 1 (4.55) | 3 (13.64) | 60.64 |

*Kruskal–Wallis test: $\chi^2=8.479$, $df=4$, $P=0.076$

disturbed unless they become stained by discharge, clinical signs of infection are present, or the patient shows signs of systemic infection.²⁴ From this study, it is not necessary to dress a wound after 24 h. This is in agreement with Chrintz *et al.*²⁵ who suggest that it is not necessary to dress a closed surgical wound at all after 48 h. Some patients, however, may prefer to have their wound dressed. The purpose of which is to protect the wound against bacterial contamination that remains a significant source of postoperative morbidity.²⁶ This study shows that exposure does not really predispose the surgical wound to infection and hence less healing. This in agreement with a previous study where it was reported that open wound dressing method is less likely to cause wound infection and due to dry atmosphere and less frequent change of dressing.²⁷

CONCLUSION

Though the method of dressing depends on the choice of surgeon closed dressing method has not proved to be a better option to prevent wound infection than open dressing method. We can, therefore, state that early exposure of surgically clean wounds does not impair healing.

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Conflicts of interest

There are no conflicts of interest.

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