



E-ISSN: 2616-3470
P-ISSN: 2616-3462
© Surgery Science
www.surgeryscience.com
2018; 2(4): 16-18
Received: 05-08-2018
Accepted: 09-09-2018

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Effect of the different bacteria's presenting in the ulcers of the take-up on skin grafting

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Abstract

Background and objective: Skin act as a barrier to fluid loss and provide important protection against invasion by micro-organisms. The main objective of the present study is investigated the effect of different bacteria's presenting in ulcers on take-up of skin grafting.

Research design: The observational and clinical design was applied in the purpose of the present study.

Method: total 100 patients who admitted in the department of surgery and plastic surgery ward were included in present study.

Result: The graft loss was significant in ulcers colonized with *Staphylococcus aureus* bacteria when compared with ulcers with no growth ($p=0.037$). In our study the graft loss was significant in *Pseudomonas* infected ulcers when compared to ulcers with no growth ($p=0.40$). Ulcers when colonized with *Klebsiella*, *Proteus*, *E. coli*, *Citrobacter* graft take above 90%, it was observed in 20/34(58.8%) of the patients, while in ulcers with no growth 17/23(73.9%), ($p=0.40$) it is positively significant.

Conclusion: findings of the study we are concluded that the colonization of ulcers by *Pseudomonas aeruginosa* and *Staphylococcus aureus* relatively poor graft survival, and the other bacteria like *Klebsiella*, *Proteus*, *E. coli*, *Acinetobacter* etc, had a higher graft survival compared to other bacteria.

Keywords: Skin grafting, bacteria

Introduction

The skin is the first line of defense to protect the body from dehydration, injury, and infection. To meet these needs, the skin has evolved an elaborate differentiation process that results in a tough, water-impermeable outer covering that is constantly renewable [1]. The skin surface is important as a biological layer for homeostasis. Restoring the skin surface is therefore critical even if underlying structure can wait later reconstruction. Skin act as a barrier to fluid loss and provide important protection against invasion by micro-organisms [2]. An ulcer is a break in the continuity of the covering skin or epithelium [3]. Skin loss many occur in full thickness burns, degloving injuries, necrotizing fasciitis, chronic ulcer and after some surgery for tumor and some non-malignant conditions [4]. Without skin wound heals by secondary intention with fibrosis and contracture and underlying structure are vulnerable to necrosis, chronic infection and dysfunction [5]. Early closure of the defect is the best if it can be achieved [6].

Bacteria colonizing the ulcers are commonly *Staphylococcus*, *Streptococcus*, *Pseudomonas*, *Proteus*, *E. coli*, *Klebsiella*, Anaerobes [7]. These bacteria's may secrete toxins (exotoxins/endotoxins) or enzymes which are responsible for the skin graft failure. Three group of bacteria have been reported as reducing the success rate of skin grafting: -

1. Beta haemolytic streptococci [9]
2. *Pseudomonas* [8, 10]
3. *Staphylococcus* [8, 11]

The prerequisites for successful grafting are known to us an adequately vascularized recipient bed, a good graft, accurate approximation and immobilization of the graft in relation to the ulcer, avoiding fluid collection below the graft and good diet and nursing care [12]. Even when these conditions are met, graft may fail due to bacterial colonization of the ulcer either preoperatively or after the procedure [8].

A large portion of the patients were suffering from non-healing ulcers belongs to lower socio-economic status, hence cannot afford state of the art treatment and high grade antibiotics which often go hand in hand with the treatment of above mentioned bacteria. Secondary a great deal of time and efforts is spent in pre-operative care to get rid the ulcer of colonized bacteria.

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Objective

The main objective of the present study is investigated that the effect of the different bacteria's presenting in ulcers on take up of skin grafting.

Research design

The observational and clinical design was applied in the purpose of the present study.

Method

Sample inclusion criteria

Total 100 samples were selected for the present study, the present sample were selected in some criterion below- non healing ulcers, diabetic ulcers, burn ulcers (electric/thermal), skin grafting after post burn contracture excision, post traumatic ulcers, and post infective ulcers.

Sample exclusion criteria

Some condition of the patients was not eligible of fulfil the criterion of the study, such as full thickness skin grafts, age less than 15 years and more than 60years, presence of slough on the recipients site, malignant ulcer, mycetoma, chronic granulomatous disease etc.

Procedure in sampling

An analytical study was conducted in the Dr. B.R. A. Memorial Hospital Raipur (CG) associated with Pt. J.N.M. Medical College Raipur over a period of Dec.2011 to Sept. 2013 on patients who were admitted with the ulcers and underwent skin grafting of the department of general surgery.

Technique, Clinical observation and examination of selected sample

Detailed history of cases recorded at the time of admission in the following proforma, name and address, age and sex, patients chief complain and presenting illness, past history in any illness, personal history, family history, socioeconomic status, history of diabetes mellitus, anaemia, chronic renal failure, tuberculosis, nutritional status of the patients, drug history.

An elaborate clinical examination was done of the patients, conducted and findings were noted in the following proforma.

General examination: Pulse rate, blood pressure, respiration, pallor, oedema, lymph node status.

Ulcer examination: Site of the ulcer, size of the ulcer, margin, edge, base of the ulcer, discharge from the ulcer-colour, odour, amount, extent of infection, examination of surrounding parts, examination of draining lymph nodes.

The ulcers measured at its greatest length and breadth. The two measurement are them multiplied to give an approximate area of the ulcers in cm². Each patient was investigated their fitness.

Blood examination: Haemoglobin, blood urea, creatinine, serum electrolytes, fasting and post-prandial blood sugar level, serum total protein level, other tests as indicated by the patients, condition or co-morbidities.

Radiological examination: Plain X- ray indicating the bony injury present or not, colour Doppler (arterial and venous) to rule out vascular abnormalities.

Bacteriological examination

Method of sample collection-pus discharge was collected from

the ulcers with cotton swab culture stick on admission, 48 hrs before grafting and post operatively at the time of first dressing with maintaining sterile condition than sample send to the lab for culture and sensitivity test.

Culture of bacteria- pus sample collected was inoculated in blood Agar and Mac Conkey media for growth and isolation of pure culture using streak plate method, the inoculated petriplate were incubated at 37⁰c for 24 hours.

Identification of bacteria- Gram staining- the staining technique consists of four steps- 1) primary staining with a dye gentian violet, 2) application of dilute solution of iodine, 3) decolourisation with an ethanol, 4) counterstaining with a dye carbol fushin or safranine.

The gram stain differential bacteria into two groups-

- Gram positive- those bacteria that retain primary stain and appear violet.
- Gram negative- those bacteria that decolorized by organic solvents and take counter stain, appearing red.

Statistical Analysis: Purpose of the present study descriptive analyses was done.

Result

A large portion of the patients were suffering from non-healing ulcers belongs to lower socio-economic status, hence cannot afford state of the art treatment and high grade antibiotics which often go hand in hand with the treatment of above mentioned bacteria. Secondary a great deal of time and efforts is spent in pre-operative care to get rid the ulcer of colonized bacteria. Finding of the result in the present on below tables-

Table 1: Shows the graft take in ulcers with *Staphylococcus aureus* to those with no growth

Graft take percentage	<i>Staphylococcus aureus</i>	No growth
<50	6	1
51-60%	3	0
61-70%	4	0
71-80%	7	0
81-90%	1	5
91-100%	3	17
Total	24	23

Reveal that the table no 1 shows that in our study ulcers colonized with *Staphylococcus aureus*, we observed more than 90 – 100% graft take was in 3/24(12.5%) and in ulcers with no growth was 17/23(73.9%).

Less than 50% graft take up was seen in 6/24(25%) of the patients. The graft loss was significant in ulcers colonized with *Staphylococcus aureus* bacteria when compared with ulcers with no growth (p=0.037).

Table 2: Shows the graft take in ulcers with *Pseudomonas* to those with no growth

Graft take percentage	<i>Pseudomonas</i>	No growth
<50	8	1
51-60%	2	0
61-70%	4	0
71-80%	6	0
81-90%	0	5
91-100%	1	17
Total	21	23

Table no.2 shows that the 8/21(38.1%) patients were colonized with the *Pseudomonas* bacteria it is shows less than 50% graft

take, 14/21(66.6%) patients were shows up to 70 graft take and only 1/21(4.8%) patients shows more than 90% graft take. In our study the graft loss was significant in *Pseudomonas* infected ulcers when compared to ulcers with no growth ($p=0.40$).

Table 3: Shows the graft take in ulcers with other bacteria (*Klebsiella*, *Proteus*, *E. coli* etc.) those with no growth

Graft take percentage	Other bacteria	No growth
<50	0	1
51-60%	0	1
61-70%	0	0
71-80%	4	0
81-90%	9	5
91-100%	20	17
Total	34	23

Table no.3 shows the ulcers colonized with other bacteria like *Klebsiella*, *Acinetobacter*, *Citrobacter*, *E. coli*, *Proteus*, Enterococcus species, beside *Pseudomonas* and *Staphylococcus* colonization shows no significant less than 50% graft take.

Ulcers when colonized with *Klebsiella*, *Proteus*, *E. coli*, *Citrobacter* graft take above 90%, it was observed in 20/34(58.8%) of the patients, while in ulcers with no growth 17/23(73.9%), ($p=0.40$) it is positively significant.

Discussion

The present study was included in 100 cases of ulcers admitted in the department of surgery and plastic surgery wards of Pt. Jawaharlal Nehru Memorial Govt. Medical College and Associated Dr. Bhemrao Ambedkar Memorial Govt. Hospital Raipur, Chhattisgarh State. This study was done to be find out to the effect of the different bacteria's presenting in ulcers on take up of skin grafting. Very few studies are available in the similar findings. Some studies were approving our result, Gilliland [8] described that examination of the swab results from the 8 ulcers that were show to heal postoperatively and 8 ulcers that recurred 6 days to 8 months after discharge from hospital revealed that 15 out of 16 (94%) grew *S. aureus*, none had *Pseudomonas* isolated from them. After eighteen months 8% of these ulcers remain active.

Matsumura *et al.* [11] showed occurrence of melting graft wound syndrome developed in 29 out of the 1359 patients evaluated. Swab wound cultures from these patients mainly grew *Staphylococcus aureus*, and none grew *Streptococcus* species. Jackson, *et al.* [9] showed that isolation of *Pseudomonas* from ulcers immediately prior to skin grafting significantly affected graft take. Other studies mention that wound *Pseudomonas aeruginosa* concentration greater than 10^5 colony-forming units/gm of tissue prevent wound healing. However, it has not been determined whether it is the number of bacteria or a toxin produced by these organisms that impedes the wound healing process.

Another study of *Pseudomonas* in chronic venous leg ulcers by Trine & Thomas [13] showed that 33.3% ulcers with *P. aeruginosa* were healed by 12 weeks, while 73.1% ulcers without *P. aeruginosa* were healed by 12 weeks. The *P. aeruginosa* in chronic venous leg ulcers has considerable impact on partial take or rejection of split thickness skin graft. Gilliland [8] had observed greater than 90% uptake in 67% cases of ulcers colonized with gram negative bacteria.

Wistrom *et al.* [14] stated that chronic venous leg ulcers are contaminated or colonized with bacteria that seldom affect ulcer healing. According to their study enterococci, anaerobic bacteria and gram-negative bacteria including *Pseudomonas* species

often colonize chronic ulcers, but do not usually cause antibiotic requiring infection.

Conclusion

Findings of our present study we are concluded that the colonization of ulcers by *Pseudomonas aeruginosa* and *Staphylococcus aureus* relatively poor graft survival, and the other bacteria like *Klebsiella*, *Proteus*, *E. coli*, *Acinetobacter* etc, had a higher graft survival compared to other bacteria.

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