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Original Article

A Comparative Study to assess the Knowledge Regarding Neonatal Resuscitation among Staff Nurses Working in NICU at Selected Government and Private Hospitals of District Amritsar, Punjab

Kiranbir Kaur[1], Baljinder Kaur[2]

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Abstract

Background: The neonates are at risk for various health problems, increasing morbidity and mortality rates. Nursing personnel have important responsibilities to assess neonatal for early detection of problems and initiate prompt management.

Objective: The objective was to assessthe knowledge regarding neonatal resuscitation among staff nurses working in NICUs in private and government hospitals in Punjab and to provide an informational booklet to staff nurses regarding neonatal resuscitation to reduce the infant morbidity and mortality rate.

Materials and Methodology: A non-experimental comparative study design and quantitative research approach were utilized. The setting for the private hospital was Grover hospital, Amritsar and the government hospital was a civil hospital, Amritsar with a sample size of 100 staff nurses 50 from a private hospital and 50 from a government hospital selected by using a convenience sampling technique. The tool was divided into two sections- demographic characteristics and 30 self-structured knowledge questionnaires on neonatal resuscitation. The data collection was done in the month of February 2019. The Guttman method assessed the knowledge questionnaire's reliability (r=.735).

Results: The results of the study revealed that of staff nurses working in private hospitals 68% had average knowledge and of the staff nurses working in governmental hospitals 64% had average knowledge. It suggests that staff nurses working in NICU should be updated with efficient knowledge and skill in performing neonatal resuscitation.

Keywords: Neonatal Resuscitation; Knowledge; Resuscitation; Staff nurses; NICU.

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INTRODUCTION

"Every child has the right to survival and life."

Rabinder Nath Tagore

The process of the birth of a baby is a very complex process which takes 38-42 weeks to complete at term. After delivery, the newborn makes many adjustments in the extrauterine environment. The

birth of a baby is a wonderful yet very complex process. The period from birth to 28 days of life is called the neonatal period and the infant in this period is termed a neonate or newborn baby.[1]

The neonates are at risk for various health problems, increasing morbidity and mortality rates. Nursing personnel have important responsibilities to assess neonatal for early detection of problems and initiate prompt management. Neonatal resuscitation is the basic emergency procedure for life support consisting of artificial respiration and cardiac massage to a newborn ranging from birth to 28 days. Only 10% of newborns require some assistance to begin breathing at birth and 1% or more may require intensive resuscitation efforts. It consists of artificial respiration, cardiac massage and medication.[2-4]

In India, birth asphyxia is a major cause of infant mortality and morbidity responsible for 25-35% of death that occur during neonatal and perinatal periods. Responding to a query on intervention to address the problem of birth asphyxia, members stressed that is manageable with timely and correct resuscitation techniques and share resources and experiences towards improving the management of neonatal resuscitation in health facilities.[5]

Being prepared is the first and most important step in delivering effective neonatal resuscitation. At every birthing location, personnel who are adequately trained in neonatal resuscitation should be readily available to perform neonatal resuscitation. This person should have the necessary skills to evaluate the infant, and, if required, to initiate resuscitation procedures such as positive pressure ventilation, and chest compression, to carry out a complete neonatal resuscitation including endotracheal intubation and administration of medications.[6]

AIM

The study aims to assess the knowledge regarding neonatal resuscitation among the staff nurses working in NICU at selected Private and Government Hospitals and to provide an informational booklet to staff nurses regarding neonatal resuscitation to reduce infant morbidity and mortality rate.

OBJECTIVES

1. To assess the knowledge regarding neonatal resuscitation among staff nurses working in NICU at selected Private Hospitals of District Amritsar, Punjab.
2. To assess the knowledge regarding neonatal resuscitation among staff nurses working in NICU at selected Government Hospitals of District Amritsar, Punjab.
3. To compare the knowledge regarding neonatal resuscitation among staff nurses working in NICU at selected Private and Government Hospitals of District Amritsar, Punjab.
4. To find out the association between the knowledge score of staff nurses with selected socio-demographic variables.
5. To develop an informational booklet regarding neonatal resuscitation for nurses who are working in NICU at selected Private and Government Hospitals of District Amritsar, Punjab.

OPERATIONAL DEFINITIONS:

1. ***Assess:*** It refers to the statistical measurement of knowledge among staff nurses regarding neonatal resuscitation.
2. ***Knowledge:*** It refers to an appropriate response from the staff nurses about neonatal resuscitation through the items of structured knowledge questionnaires.
3. ***Neonatal resuscitation:*** It refers to intervention after the baby's birth with a bag and mask technique to help to breathe and maintain heart rate.
4. ***Staff nurses:*** Registered nurses and midwives who are working in NICU.
5. ***NICU:*** It refers to the neonatal intensive care unit, a highly technical specialized unit in a hospital that provides medical nursing care and technological support to sick and high-risk neonates and premature babies.
6. ***Selected hospitals:*** Grover hospital, Amritsar and civil hospital, Amritsar.

MATERIALS AND METHODS

A non-experimental comparative study design and quantitative research approach were utilized to achieve the study's objectives, i.e. to assess neonatal resuscitation knowledge among Staff Nurses working in Selected Private and Government Hospitals of District Amritsar, Punjab. Ethical clearance was taken from the institutional ethical committee to conduct the study and informed

consent was obtained from the subjects. The setting for the private hospital was Grover hospital, Amritsar and the government hospital was a civil hospital, Amritsar. The sample size was 100 staff nurses 50 from a private hospital and 50 from a government hospital selected using a convenience sampling technique. The Tool was prepared to collect data and validated by experts divided into two sections, Section A included demographic characteristics and Section B included 30 self-structured knowledge questionnaires on neonatal resuscitation consisting of questions related to meaning, indication, assessment and techniques of resuscitation. The data collection was done in the month of February 2019. The Guttman method assessed the knowledge questionnaire's reliability (r=.735). The tool was found to be reliable. The data was collected and analyzed using descriptive and inferential statistics including frequency, percentage, mean and standard deviation.

Inclusion criteria include the staff nurses who were

- Working in the NICU area
- Available at the time of data collection
- Able to read and understand English

Exclusion criteria includethe staff nurses who were

- Not willing to participate in the study
- Absent during data collection

Scoring Criteria:

For the right answer, 1 mark will be given and for the wrong answer 0 mark will be given:

- Scores ranging from 0-10 would be considered poor knowledge
- Scores ranging from 11-20 would be considered average knowledge
- Scores ranging from 21-30 would be considered good knowledge.

RESULTS

The major findings of the study are as follows:

1. Findings related to staff nurses' socio-demographic variables working in NICU at private and government hospitals of Amritsar Punjab.

- Majority of the staff nurses working in the government hospital were 21-25 yrs of age i.e. 19 (38%) while the staff nurses working in the private hospital were 21-25 yrs of age i.e. 25 (50%).
- According to gender, 36 (72%) were female staff nurses in government hospital and 42 (84%) were female staff nurses in a private hospital.
- Majority of staff nurses are married in government and private hospital, i.e. 31(62%) and 27 (54%) respectively.
- Majority of staff nurses qualified GNM nursing in both government and private hospital, i.e. 24 (48%) and 23 (46%).
- According to the nature of the job, the majority of staff nurses working in government hospital were permanent 33(66%) and in the private hospital were temporary i.e. 35 (70%).
- Majority of staff nurses had 1-5 years of experience in both government and private hospital, i.e. 21 (42%) and 25 (50%).
- According to the source of information on neonatal resuscitation, the majority of staff nurses gained information through in-service education in both government and private hospital, i.e. 15(30%) and 17(34%) respectively.

2. Findings related to the level of knowledge regarding neonatal resuscitation among staff nurses working in government and private hospitals.

Level of knowledge	Government hospital		Private hospital	
	F	%	f	%
Poor Knowledge (0-10)	14	28%	8	16%
Average Knowledge (11-20)	32	64%	34	68%
Good Knowledge (21-30)	4	8%	8	16%

Maximum Score - 30

Minimum Score – 0

The above table result reveals that of staff nurses working in government hospital, 14 (28%) had poor knowledge, 32 (64%) had average knowledge and 4 (8%) had good knowledge. The level of knowledge among staff nurses working in private hospital, was 8 (16%) had poor knowledge, 34 (68%) had average knowledge and 8 (16%) had good knowledge regarding neonatal resuscitation. Hence, it is concluded that staff nurses working in private hospital and government hospital have average knowledge regarding neonatal resuscitation.

3. Findings related to comparing the knowledge regarding neonatal resuscitation among staff nurses working in NICU at selected Private and Government Hospitals of District Amritsar, Punjab.

N=100

Level of knowledge	*f*	Mean	SD	t-value	df	p-value
Government hospital	50	15.14	4.36	1.504	98	0.067 NS
Private hospital	50	16.44	4.27			

***Key*: NS – Non-significant**

p-value= 0.005

The findings of the above table revealed that the mean difference between the level of knowledge regarding neonatal resuscitation among staff nurses working in government and the private hospital was 1.30. The results of the study reveal that there is no significant difference between the level of knowledge regarding neonatal resuscitation among staff nurses working in government and private hospital.

4. Findings related to the association between knowledge of staff nurses with selected socio-demographic variables such as Age, Gender, Professional Education, Marital status, Source of information, nature of the job, and year of experience in NICU.

The association between the level of knowledge regarding neonatal resuscitation and demographic variables among staff nurses in government hospital was tested by using the chi-square test. The result reveals that professional qualification was found significant with the level of knowledge at a p-value less than 0.05 level of significance. The demographic variables such as age, gender, marital status, experience, and source of information were not found significant association with the level of knowledge regarding neonatal resuscitation among staff nurses working in government hospital.

The association between the level of knowledge regarding neonatal resuscitation and demographic variables among staff nurses in private hospital was tested by using a chi-square test. The result reveals that the professional experience of staff nurses was found significant with the level of knowledge at a value less than 0.05level of significance. The demographic variables such as age, gender, marital status, qualification, nature of the job, and source of information were not found significant association with the level of knowledge regarding neonatal resuscitation among staff nurses working in private hospital.

DISCUSSION

Objective 1: To assess the knowledge regarding neonatal resuscitation among staff nurses working in NICU at selected Private Hospitals of District Amritsar, Punjab.

The level of knowledge regarding neonatal resuscitation among staff nurses, the result reveals that of staff nurses working in a private hospital, 8(16%) had poor knowledge, 34(68%) had average knowledge and 8(16%) had good knowledge regarding neonatal resuscitation.In the private hospital, the staff nurses had an average mean and SD of knowledge score was 16.44±4.27. The finding was supported by ***Gauro P., Saha A.,*** and ***Adhikari B(2018)***[7] in a study that 93% of respondents had inadequate knowledge scores. The mean of the respondent's knowledge score on newborn resuscitation was 17.16 ± 2.68 standard deviation; per cent of the mean score was 66, and the range was 10-23.The study showed that most of the respondents 78(90.7%) had insufficient skills in newborn resuscitation.

Objective 2: To assess the knowledge regarding neonatal resuscitation among staff nurses working in NICU at selected Government Hospitals of District Amritsar, Punjab.

The level of knowledge regarding neonatal resuscitation among staff nurses, the result reveals that staff nurses working in the government hospital, 14 (28%) had poor knowledge, 32 (64%) had average

knowledge and 4 (8%) had good knowledge. The staff nurses working in government hospitals had an average mean and SD of knowledge score was 15.14±4.36. The finding was supported by ***RW Gracy's (2012)***[8] level of knowledge on newborn resuscitation and assessment revealed that in Group A at a public health facility, 53.33% had moderately adequate knowledge and 46.67% had adequate knowledge.

Objective 3: To compare the knowledge regarding neonatal resuscitation among staff nurses working in NICU at selected Private and Government Hospitals of District Amritsar, Punjab.

The Comparison of the Mean and SD of knowledge score regarding neonatal resuscitation among staff nurses in Government and private hospital reveals that the staff nurses working in government hospitals had an average mean and SD of knowledge score was 15.14±4.36. In the private hospital, the staff nurses had an average mean and SD of knowledge score was 16.44±4.27. The mean difference between the level of knowledge regarding neonatal resuscitation among staff nurses working in government and the private hospital was 1.30. The findings were supported by ***Suresh PM, Kumar TR et.al. (2017)***[9] When asked about all the steps ofresuscitation 34% of nurses got a score of 85% and above. Of that 22% of government nurses and 25% of private nurses scored above 85%. There is not much difference in the score results between the nurses of government and private hospitals. 34% of nurses scored more than 85%.

Objective 4: To find out the association between the knowledge score of staff nurses regarding neonatal resuscitation with selected socio-demographic variables.

The association between the level of knowledge regarding neonatal resuscitation and demographic variables among staff nurses in government hospitals was tested by using the chi-square test. The result reveals that professional qualification was found significant with the level of knowledge at a p-value less than 0.05 level of significance. The demographic variables such as age, gender, marital status, experience, and source of information were not found significant association with the level of knowledge regarding neonatal resuscitation among staff nurses working in government hospitals.

The association between the level of knowledge regarding neonatal resuscitation and demographic variables among staff nurses in a private hospital was tested by using a chi-square test. The result reveals that the professional experience of staff nurses was found significant with the level of knowledge at a value less than 0.05 level of significance. The demographic variables such as age, gender, marital status, qualification, nature of the job, and source of information were not found significant association with the level of knowledge regarding neonatal resuscitation among staff nurses working in a private hospital.

The finding was supported by ***Gauro P., Saha A., and Adhikari B (2018)***[7] in a study that there was no significant association between the level of knowledge regarding newborn resuscitation with age (p=0.17), and total working experience (p=0.76). Working experience in the maternity ward (p=0.33), in-service training (p=0.33) and no. of newborn resuscitation performed in the last six months (p=0.60). It also revealed that the level of skill in Newborn resuscitation is statistically significant with total working experience (p=0.034), Working experience in the maternity ward (p=0.028) In-service training on newborn resuscitation (p=<0.001).

Objective 5: To develop an informational booklet regarding neonatal resuscitation for nurses who are working in NICU at selected Private and Government Hospitals of District Amritsar, Punjab.

It was supported by a study conducted by ***MH Mahaling (2015)***[10] that the Structured Informational Module was an effective method of teaching the staff nurses to improve their knowledge regarding neonatal resuscitation.

CONCLUSION

The study concludes that staff nurses working in government and private hospitals had average knowledge regarding neonatal resuscitation as well as need adequate training in neonatal resuscitation. The staff nurses working in NICU should be updated with efficient knowledge and skill in performing neonatal resuscitation.

Nursing Implications: The findings of this study can be utilized in all the domains of nursing i.e. nursing practice, nursing education, nursing research and nursing administration, the implications are:

Nursing Practice

- Nurses should have efficiency in assessing the neonates for resuscitation

- Nurses must have adequate knowledge and skill to assess neonates during emergencies.
- Nurses must be aware of the neonates in critical stages which could be better for providing resuscitation and quality of care for the neonates.
- Nurses should have adequate practice in performing neonatal resuscitation to save the life of the neonates and increase the survival rates.

Nursing Education

- The nurses should be trained in the assessment of neonates in critical states in the NICU.
- The nurses should be educated about the appropriate/efficient performance of neonatal resuscitation in the NICU.
- The nurses should have training sessions about recent changes in evidence based practices and to ensure an update of their knowledge and practice
- Educate the nurse students about neonatal resuscitation and make them practice efficiently to apply it in clinical settings.

Nursing Administration

- The nurse administrator should plan for in-service education for nursing personnel regarding the performance of neonatal resuscitation.
- Nurse administrators should implement a strict protocol for performing neonatal resuscitation according to the guidelines.
- Nurse administrators should plan for periodic evaluation of nurses' skills in performing neonatal assessment and resuscitation in a clinical setting.
- Nurse administrators should implement in-service education/continuing education on neonatal resuscitation and its practice.

Nursing Research

- Nursing research has to be carried out to evaluate the knowledge and practice among nurses on neonatal assessment and resuscitation.
- Nursing research helps the nursing personnel to apply evidence based practices into clinical practice on providing efficient care to neonates.
- Nursing research to be conducted to assess the performance of nurses on neonatal assessment in NICU and their practice.
- Nursing research to be conducted onthe evaluation of nurses and their performance in providing efficient care to the neonates in NICU.

Limitations

- The study was limited to a small sample size.
- The study was limited to staff nurses working in selected government and private hospital.

Recommendations

- A study can be conducted to assess the effect of educational programmes on neonatal resuscitation.
- A study can be conducted on a large sample size in different study settings.
- A study can be conducted to assess the performance of nurses inthe assessment of neonates in clinical settings.
- A study can be conducted to assess the current practices of the staff nurses on neonatal resuscitation.

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Original Article

Role of Tri-layer Scaffold in Wound bed Preparation in Necrotizing Fasciitis

Shivanand Hoshamani[1], Ravi Kumar Chittoria[2], Barath Kumar Singh. P[3]

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Abstract

Necrotizing fasciitis is an infection of subcutaneous tissue and fascia which may spread rapidly to deeper tissue and surrounding tissue which may cause damage to the tissue and present as a localized infection and fulminant septic shock with high mortality rate. The patient will undergo extensive debridement for the removal of necrotic tissue which creates extensive huge raw area and Scaffold has been found to be effective in wound bed preparation. This study highlights our experience in wound bed preparation using scaffold as an adjuvant in a case of necrotizing fasciitis.

Keywords: Scaffold; Wound bed preparation; Necrotizing fasciitis.

INTRODUCTION

Necrotizing soft tissue infections (NSTIs) include necrotizing forms of fasciitis, myositis, and cellulitis. These infections are characterized clinically by fulminant tissue destruction, systemic signs of toxicity, and high mortality.[1] Accurate diagnosis and appropriate treatment must include early surgical intervention and antibiotic therapy. Several different names have been used to describe the various forms of necrotizing infections; this is related in part to naming based on clinical features rather than surgical or pathologic findings. The degree of suspicion should be high since the clinical presentation is variable and prompt intervention is critical. The lay press has referred to organisms that cause NSTI as flesh eating bacteria.[2] There is sufficient evidence to conclude that healing of necrotizing fasciitis is accelerated by scaffold. Though it is well established therapy in the armamentarium of wound management, its role in wound bed preparation before cover by skin graft or flap has not been studied well. The Scaffolds has been found to be effective in wound bed preparation. This study highlights our experience in wound bed preparation using tri-layer biological scaffold in a case of necrotizing fasciitis.

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MATERIALS AND METHODS

This study was conducted in the department of plastic surgery in a tertiary care center after obtaining the departmental ethical committee approval. Informed written consent was taken from the patient. The study is a prospective observational type done on a 60 year old male with known co-morbidities including hypertension & coronary artery disease with ejection fraction of 25%. Patient presented with raw area (Fig. 1) over left lower limb & perineum of one month duration. He was apparently well one month back when he developed multiple blebs over left lower

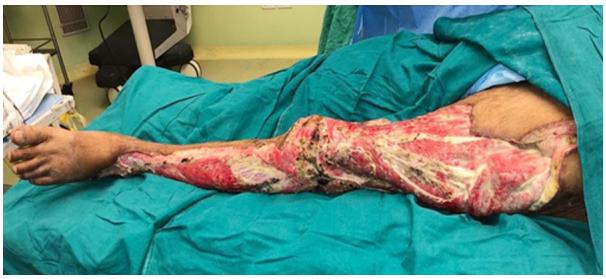

Fig. 1: At admission with raw area after extensive debridement of necrotizing fasciitis of left lower limb.

limb & perineum which ruptured leaving raw area with rapid progression of wound infection with foul smelling discharge. He was diagnosed with clinically as a case of necrotizing fasciitis. He underwent multiple debridement in referral surgery department after that he was referred to department of plastic surgery for further wound care. There are various modalities of regenerative wound care out of which here we used tri-layer scaffold (Fig. 2) as a regenerative modality for wound care. After debridement, biological coverage of the raw area of the wound was done with scaffold. Written informed consent was obtained from both the parents. The regeneration scaffold was prepared in the department of plastic surgery using materials already available in the department.

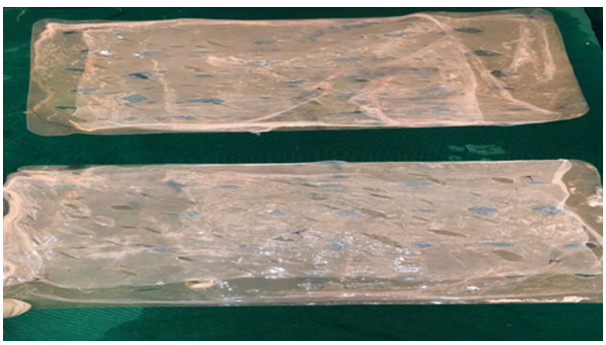

Fig. 2: Tri layer scaffold

The three layers from outer to inner are as follows (Fig. 2)

1. Silicone
2. Collagen
3. Amniotic membrane

Amniotic membrane was harvested from the obstetric department of the same institution. The amniotic membrane was taken from a healthy woman, who had a healthy pregnancy, who was screened for hepatitis B and C, HIV 1, 2 and VDRL, taken after a cesarean birth. The amniotic membrane was irrigated with saline and treated with heparin, antimicrobial, antifungals and glycerol under refrigeration.

Steps of preparation:

All the three layers from out to in were placed one over the other and sutured together using absorbable undyed 4.0 polyglactin sutures. The three layer regeneration scaffold was applied once a week under anesthesia after debridement (Fig. 3) and the patient was treated with antibiotics according to culture and sensitivity and also nutritional support.

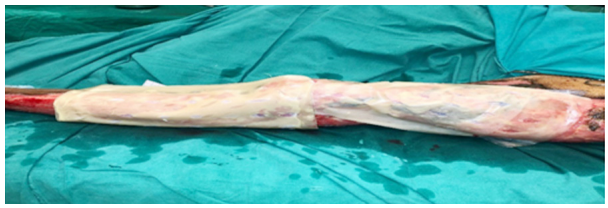

Fig. 3: Tri-layer scaffold application over the wound

RESULTS

The Tri-layer regeneration scaffold is effective in regenerating the wound following necrotizing fasciitis. The wound granulated well (Fig. 4) and planned for wound cover with skin grafting.

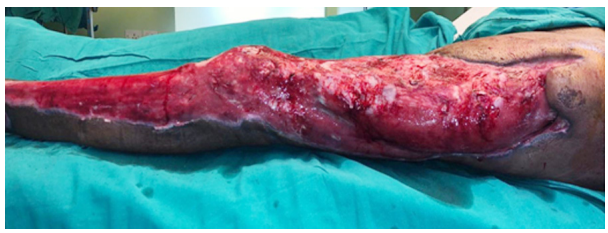

Fig. 4: Wound bed with healthy granulation tissue

DISCUSSION

Necrotizing fasciitis is a rare but life-threatening condition, with a high mortality rate (median

mortality 32.2%) that approaches 100% without treatment. Numerous conditions are associated with this pathology, such as diabetes mellitus, immunosuppression, chronic alcohol disease, chronic renal failure, and liver cirrhosis, which can be conductive to the rapid spread of necrosis, and increase in the mortality rate. The diagnosis of NF is difficult and the differential diagnosis between NF and other necrotizing soft tissue infections more so. However, the clinician should do their utmost to secure the diagnosis of NF, as a delay in diagnosis can be fatal, and septic shock is inevitable if the disease remains untreated. The characteristic of NF is the clinical status change over time. The early clinical picture includes erythema, swelling, tenderness to palpation, and local warmth; once the infection develops, the infection site presents skin ischemia with blisters and bullae. The diagnosis of NF can be secured faster with the use of laboratory based scoring systems, such as the LRINEC score or the FGSI score, especially in cases of Fournier's gangrene. However, the diagnosis is definitely established by performing explorative surgery at the infected site.[1,2]

Management of the infection begins with antibiotic treatment. In the majority of cases with NF (70–90%) the reasonable pathogens are two or more, suggesting the use of broad spectrum antibiotics. The value of antibiotic treatment in NF is relatively low, and early and aggressive drainage and debridement is required. In NF of the extremities, the clinician should consider amputating the infected limb, although this will not reduce the risk of mortality. Finally, post-operative management of the surgical wound is important, along with proper nutrition of the patient. If larger parts of the total body surface area have been involved, we usually use autologous skin grafts meshed to enlarge the size of the graft. The disadvantage of such practices is morbidity, like pain at the donor site, corrugated scar as the recipient site. In cases of total or near total full thickness injuries, donor site may be inadequate. In that case, other treatment option like allograft, heterograft were used. Such allograft represents temporary measures for immediate wound coverage in the acute stages post-injury. Tissue engineered skin grafts aim toenable complete and natural and accelerated wound regeneration.[3] One of the major applications of scaffolds in plastic and reconstructive surgery is in the healing of cutaneous wounds. The natural embryogenesis and regeneration of tissues should be considered when designing biodegradable scaffolds.[3,4] Regeneration is tissue dependent, and epithelial tissues and their basement membrane regenerate only when the stroma is intact or has itself been repaired. Various scaffolds can be used as advanced wound dressings that expedite wound healing, by not only covering the wound and providing a barrier against bacterial contamination, but also supporting the host tissue fibroblasts and keratinocytes.[5] Currently, scaffolds have been approved for the treatment of partial- and fullthickness wounds, pressure ulcers, diabetic foot ulcers, chronic vascular ulcers, surgical wounds, venous lower extremity ulcers, and burns. These products can be cellular or acellular. Particularly of note is Integra (Integra LifeSciences Corp., Plainsboro, N.J.), a bilayer consisting of a dermal replacement material, cross linked collagen, and glycosaminoglycan hydrogel, covered by a silicone membrane (Fig. 4, left). The silicone membrane acts as a temporary dressing that keeps the wound moist and prevents bacterial contamination.[6] The dermal replacement layer acts as the scaffold, which allows formation of neo dermis. Consequently, the scaffold acts both as an adjunct to wound healing but also as a skin substitute and has been used in the treatment of burns and chronic wounds.[7] Studies have shown that use of Integra Dermal Regeneration Template in the treatment of chronic diabetic foot ulcers decreases the time needed for complete wound closure, increases the rate of wound closure, and decreases adverse events compared with standard care. Likewise, AlloPatch Pliable (Musculoskeletal Transplant Foundation, Edison, N.J.) applied to nonhealing diabetic foot ulcers reduced healing times and increased healing rates, with no reported increase in adverse events compared to standard care. Skin substitutes have also been developed from porcine urinary bladder. For example, MatriStem (ACell, Lafayette, Ind.) is developed by sterilizing porcine urinary bladder with electron beam radiation, resulting in a non–cross-linked acellular dermal matrix with an intact basement membrane that allows for normal cell attachment. Consequently, the scaffold facilitates wound healing through promotion of cellular proliferation and angiogenesis. Such scaffolds offer many advantages. In addition to being easy to administer, scaffolds have been shown to decrease the overall time to wound closure and the rate of incomplete healing.[8] Composite scaffolds are a combination of permanent and degradable materials into a scaffold. Ideally, these materials have the advantages of biological integration combined with the long term structural integrity of permanent biomaterials. Several composite scaffolds have been developed, including a monofilament mesh composed of absorbable poliglecaprone and nondegradable polypropylene, addition of nonbiodegradable poly

(methyl methacrylate) or high density polyethylene to composite bone cements, and polymer bioceramic mixtures, all of which offer specific advantages.[7,8]

In our study we used indigenously made triple layer scaffold with locally available materials at less cost, which is compatible, non-allergic and non-immunogenic to the patient.

CONCLUSION

The three layer regeneration scaffold is simple, cost effective, easy to prepare, and without any complications. Multi-center and larger volume study is required to comment on the exact findings.

Conflicts of interest: None

Authors' contributions: All authors made contributions to the article

Availability of data and materials: Not applicable

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Original Article

Role of Topical Application of Cholecalciferol with Mupirocin Ointment Combination in Management of bedsore

Nishad K.[1], Neljo Thomas[2], Ravi Kumar Chittoria[3], Barath Kumar Singh[4], Jacob Antony Chakiath[5]

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Abstract

The pressure ulcer also called bedsore or decubitus ulcer is one of the complications seen in bedridden patients and is very difficult to treat as well. Cholecalciferol has been used in a variety of disease conditions with various uses. Topical cholecalciferol has been used to be helpful in wound healing. There is evidence that vitamin D can enhance initial inflammation, advantageous during both infection and wound healing, and also promotes resolution and avoids chronic, damaging inflammation. Mupirocin is an antibiotic which can prevent infection. This article highlights the role of topical cholecalciferol and mupirocin ointment combination in wound bed preparation in the case of a pressure ulcer.

Keywords: Topical cholecalciferol; Pressure ulcer.

INTRODUCTION

Pressure ulcers are commonly seen in critically-ill patients. Surgery may be required to cover the raw area but should be used as the last resort, as recurrence is often the rule. Also, the general condition of the patients who acquires the pressure ulcer often renders them unfit for reconstruction surgery. For these reasons, pressure ulcers are mostly managed by conservative treatment. Various local wound therapies have been advocated for use in this difficult to treat the condition. The various modalities include platelet rich fibrin matrix, autologous platelet rich plasma, prolotherapy, negative pressure wound therapy etc.

Recently we have come across the journal about the role of topical cholecalciferol in wound healing. In this article, we share our experience of using topical cholecalciferol in the case of a pressure ulcer.

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METHODOLOGY

This is a case report of the use of topical cholecalciferol in a case of pressure ulcers. This study was conducted in a tertiary care hospital in 2019. The patient was 30 year male with post-spinal cord injury pressure ulcers on the bilateral ischial region (Fig. 1) for 3 months. Regular cleaning and dressing were done, and antibiotics given according to culture and sensitivity, but the wound was not showing any good sign of healing. To hasten the wound bed preparation decision was made to give a trial of topical cholecalciferol with mupirocin ointment combination.

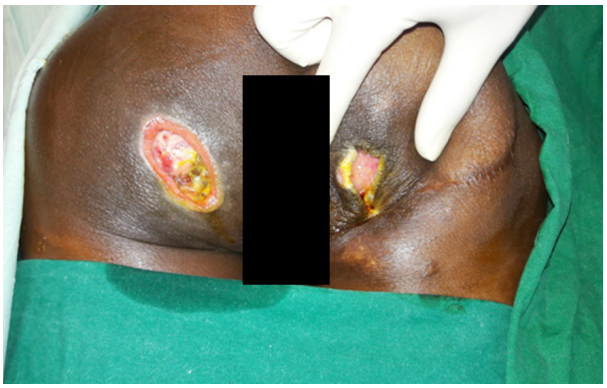

Fig. 1: Wound at the time of presentation

After debridement of the wound, topical cholecalciferol with mupirocin ointment was applied uniformly on the wound (Fig. 2). Over that non-adherent dressing was placed, and the dressing was done. Every third or fourth day, the dressing was opened and the wound was assessed. Repeat debridement was done if found necessary and topical cholecalciferol and mupirocin ointment (Fig. 3) was applied and the dressing was done. Eight such sessions of topical cholecalciferol application were done over four weeks.the cost of cholecalciferol was 30 to 50 rupees per sachet.

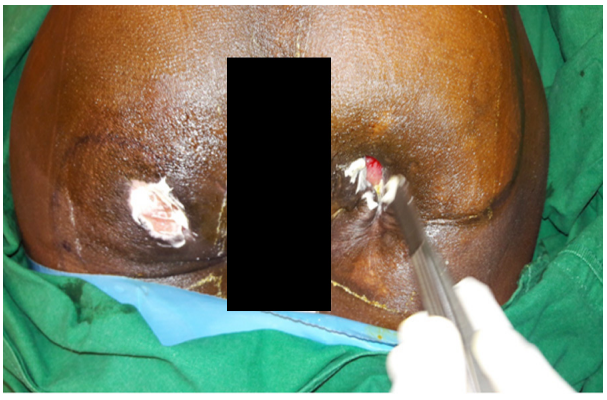

Fig. 2: Topical application of cholecalciferol

Fig. 3: Cholecalciferol for topical application

RESULT

After the application of topical cholecalciferol, the wound started granulating, the amount of slough and pus discharge also reduced. After eight sessions of topical cholecalciferol therapy over four weeks, the wound bed was prepared for the final reconstruction (Fig. 4). No adverse local or systemic effect was noted with the use of topical cholecalciferol therapy.

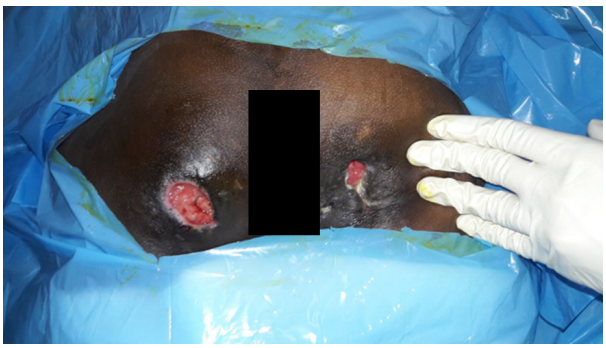

Fig. 4: Healed wound bed

DISCUSSION

Various topical antimicrobial delivery systems are available such as gentamicin in collagen dressings, minocycline in chitosan polyurethane foam, ofloxacin from silicone sheets, dialkylcarbamoyl chloride in cotton wool dressing, etc.[7,8] These delivery system allows for better drug delivery and also aids in woud healing.

Vitamin-D or cholecalciferol is known for its role in calcium homeostasis. Apart from this, its role in immunomodulation has also been described. It has

been found that Vitamin D is useful in the healing of diabetic wounds when administered systemically.[9] It also reduces inflammation associated with diabetic wounds. And also as a drug delivery agent for local wound healing. It has been found to improve corneal wound healing.[10]

Vitamin-D act as an antiproliferative, prodifferentiative, antiapoptotic, and immunomodulator. Its use both astopical and systemic have been proved beneficial in skin diseases. The vitamin-D enhance the production of anti-microbial peptides (AMP) like defensin and cathelicidin. These AMP increases the keratinocyte production and migration as well as also increase the productions of the chemokines like IL-8. It also has an immunosuppressive action in the skin. It decreases the antigen presentation by its effect on Langerhans cells and by modulating cytokine production by keratinocyte cells.[11]

CONCLUSION

Topical cholecalciferol is found useful to facilitate healing in chronic wounds in our study. However, the study was done on a single patient and needs large populationbased control trials to apply in clinical practice.

DECLARATIONS

Acknowledgment

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Availability of data and materials: Not applicable.

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Original Article

Role of Prolotherapy in Wound Bed Preparation in Necrotizing Fasciitis

Shivanand Hosamani[1], Ravi Kumar Chittoria[2], Barath Kumar Singh. P[3]

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Abstract

Necrotizing fasciitis is an infection of subcutaneous tissue and fascia which may spread rapidly to deeper tissue and surrounding tissue which may cause damage to the tissue and present as a localized infection and fulminant septic shock with high mortality rate. Prolotherapy has been found to be effective in wound bed preparation. This study highlights our experience in wound bed preparation using prolotherapy as an adjuvant in a case of necrotizing fasciitis.

Keywords: prolotherapy; wound bedpreparation; necrotizing fasciitis; regenerative medicine.

INTRODUCTION

Necrotizing soft tissue infections (NSTIs) include necrotizing forms of fasciitis, myositis, and cellulitis. These infections are characterized clinically by fulminant tissue destruction, systemic signs of toxicity, and high mortality.[1] Accurate diagnosis and appropriate treatment must include early surgical intervention and antibiotic therapy. There are many methods use for wound bed preparation, each method has a varying degree of success. Prolotherapy is one of the recent therapeutic strategies for wound healing. There are 3 stages in adult wound healing: the inflammatory phase, the proliferative phase, and the remodeling phase. These 3 stages have to occur in sequentially to result in healing of wound. Wound bed preparation is a new concept and can be summarized with the acronym T.I.M.E, T for tissue: non-viable or deficient. I for infection/inflammation, M for moisture balance. E for epidermis which was changed later to E for edge. Large wounds often require a graft or a flap for wound coverage, which require the wound bed preparation. Prolotherapy is a procedure in which an irritant is injected or sprayed into the wound. The irritant injected will initiate an inflammatory reaction, which is thought to promote healing of wound. The most common prolotherapy agent used in clinical practice is dextrose, with concentrations

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ranging from 12.5% to 25%. Dextrose is considered to be an ideal proliferant because of its water solubility, a normal constituent, and can be injected safely into multiple areas and in large quantity. Hypertonic dextrose solutions will be dehydrating cells at the injection site, leading to local tissue trauma, which in turn attracts granulocytes and macrophages and promotes healing. In this article, we highlight our experience of using prolotherapy as an adjuvant in the preparation of wound bed in necrotizing fasciitis.

MATERIALS AND METHODS

This study was conducted in the department of plastic surgery in a tertiary care center after obtaining the departmental ethical committee approval. Informed written consent was taken from the patient. The study is a prospective observational type done on a 60 year old male with known co-morbidities including hypertension & coronary artery disease with ejection fraction of 25%. Patient presented with raw area (Fig. 1) over left lower limb & perineum of one month duration.

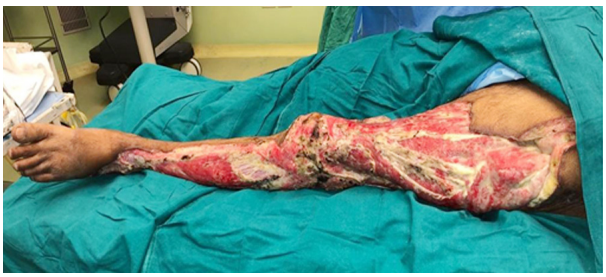

Fig. 1: At admission with extensive necrotizing fasciitis of left lower limb & perineum

He was apparently well one month back when he developed multiple blebs over left lower limb & perineum which ruptured leaving raw area with rapid progression of wound infection with foul smelling discharge. He was diagnosed with clinically as a case of necrotizing fasciitis. He underwent multiple debridement and Wound tissue culture was sent and appropriate antibiotic therapy was given. Regular cleaning and dressing were done. To hasten the wound bed preparation decision was made to give a trial of prolotherapy. Dextrose 25% solution was used as an agent for prolotherapy. It was spread evenly on to the wound followed by a non-adherent dressing (Fig. 2). A repeated session of prolotherapy was given every three days. After 3 weeks of prolotherapy wound bed was prepared and skin grafting was planned.

Fig. 2: Prolotherapy–25% Dextrose sprayed over the wound bed

RESULTS

After 8 sessions of prolotherapy over 3 weeks period, the wound showed a good sign of healing. It was covered with red granulation tissue, margins also showed advancement of epithelialization (Fig. 3). After the wound bed was prepared grafting was planned. No adverse local or systemic effect was noted with the use of prolotherapy.

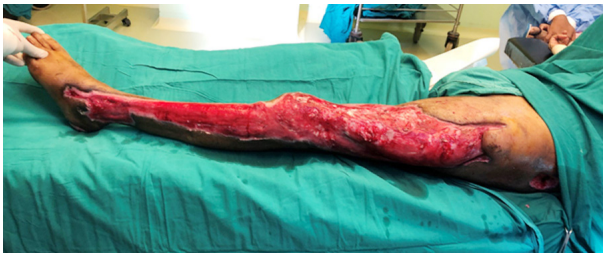

Fig. 3: Wound bed with healthy granulation tissue

DISCUSSION

Necrotizing fasciitis are severe and may be fatal. Early identification and treatment are necessary. Usually, a multidisciplinary approach is required. To properly care for such individuals, early repair and efficient rehabilitation are also imperative. Studies that span multiple disciplines and institutions are necessary. Necrotizing Fasciitis can have a complicated and time consuming course of treatment. Management of the infection begins with antibiotic treatment. In the majority of cases with NF (70–90%) the reasonable pathogens are two or more, suggesting the use of broad spectrum antibiotics. The value of antibiotic treatment in NF is relatively low, and early and aggressive drainage and debridement is required. In NF of the extremities, the clinician should consider amputating the infected limb, although this will not reduce the risk of mortality.[1,2] Finally, postoperative management of the surgical wound is important, along with proper nutrition of the

patient. In our study we used Prolotherapy as an adjuvant therapy in wound bed preparation of necrotizing fasciitis.Both hemostasis and the process of healing a wound depend heavily on platelets. Keratinocyte, fibroblast, and endothelial cell migration, proliferation, and activities are all aided by the release of cytokines and growth factors by platelets. Chronic wounds experience a delay in the inflammatory stage of recovery. The spectrum of modalities available to manage a wound is very wide. Conveniently it can be grouped into four categories conventional therapy, novel therapy, reconstructive therapy, and cell based. Conventional therapies include conventional dressings with or without topical application of antimicrobial agents, growth factors; various biological dressings such as silver and alginate; hyperbaric oxygen, etc. Novel therapies include the use of platelet-rich plasma, negative pressure wound therapy (NPWT), and skin substitutes. These are minimally invasive with much better healing efficacy than conventional therapies. Reconstructive therapy, such as skin and flap grafting, are invasive and damage the normal tissue also. Cell based therapy is rapidly emerging as a part of wound management but is seldom used alone. These cells can be harvested from bone marrow or adipose tissue.

The term prolotherapy was coined by Dr. George Hackett in 1956. This word is derived from the Latin word proles meaning offspring or progeny and the English word-therapy. It involves injecting an irritant substance (such as dextrose) into a ligament or tendon to promote the growth of new tissue. Multiple agents are used in prolotherapy, some classified as irritants (such as phenol), some as chemoattractant (commonly sodium morrhuate), and others as osmotic agents (commonly dextrose). Although the exact mechanism of prolotherapy is not clear, proponents of the technique believe that the injection of hypertonic dextrose causes cell dehydration and osmotic rupture at the injection site that leads to local tissue injury that subsequently induces granulocyte and macrophage migration to the site, with the release of the growth factors and collagen deposition.[3] In vitro studies have shown that even concentrations as low as 5% dextrose have resulted in the production of a number of growth factors critical for tissue repair. Some of these growth factors include PDGF, TGF-b, EGF, b-FGF, IGF-1, and CTGF.4In vitro studies have shown that the cultivation of cells in high glucose culture medium can increase PDGF expression. PDGF has multiple pro-reparative effects in skin wounds, including the promotion of angiogenesis, fibroblast proliferation, extracellular production. TGF-b expression is also upregulated by high glucose.[5,6] TGF-b is involved in all steps of wound healing including inflammation, angiogenesis, fibroblast proliferation, collagen synthesis, matrix deposition, and remodeling, and wound re-epithelialization. Other growth factors upregulate by high glucose include EGF,b-FGF, IGF and CTGF, all having multiple pro-reparative functions and improves healing in some animal wound models of impaired healing.[7]

Some studies on prolotherapy suggest that there are direct effects on collagen synthesis.[8] A few studies demonstrate the up-regulation of matrix in response to dextrose prolotherapy or in vitro cultivation with high concentrations of glucose. Collagen expression is increased after exposure of patellar tendon fibroblasts to the prolotherapy agents' dextrose and thus may contribute to tissue regeneration within a cutaneous wound. Collagen type I synthesis is also increased in high glucose cultivation of renal fibroblasts, in a TGF-b-mediated pathway.[9,10] Changes in the cartilage matrix protein aggrecan is reported in chondrocytes cultured in high glucose, and in patients who have received intraarticular injections of 12.5% dextrose.

CONCLUSION

In this study, we found that prolotherapy has a role in the wound bed preparation of necrotizing fasciitis. Definite conclusion cannot be made as it is a single case. Large randomized control trials are required to confirm the efficacy of Prolotherapy.

Conflicts of interest: None

Authors' contributions: All authors made contributions to the article

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Review Article

A Opinion of Nursing Stakeholder on Publications & Scholarship

Veena D. Sakhardande

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Abstract

Introduction: The common identified stakeholders in nursing are students, clinicians, educators, nurse managers. Stakeholders in healthcare system has importance because they keep the healthcare system up to date with the latest health progress and contribute to a service that is within the social interest.

Aim of the study: To assess the opinion of Nursing stakeholder on publications & to assess the opinion of Nursing stakeholder on scholarship.

Method & Material: This was a quantitative descriptive survey study of 50 samples from different states, aged 28 -48 years both male and female Head of the Institutes, Ph.D. Nursing scholars, Professor and Nursing Educator with qualification of M.Sc. Nursing, P.B.BSC and PH.D. Nursing. Non-probability purposive sampling technique was used for the selection of samples. To obtain necessary data for the study, the tool used for data collection was divided into Section I-Demographic data, Section-II assessment for opinion of Nursing stakeholder on publications and Section-III assessment for opinion of Nursing stakeholder on scholarship.

Results: Samples were from age group of 28 to 48 years. 36% Male &, 64% Female working in different Nursing Institutes and hospitals from different states of like Maharashtra, Jammu Kashmir, Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Kerala, Uttarkhand and Karnataka. Majority of samples were shown area of interest for Research i.e. clinical 58%, Gynaecology 19%, body organ donation 4%, Neurology 12% and managerial 7%. 78% participants published their researches papers in peer review journals, Web of Science, UGC care & Scopus where as 12% don't publish their research papers. 50% participants given information that students receive Scholarship & 50% don't receive scholarship. Type of different scholarship received by students were Tata, SC and ST scholarship TNAI, BPL scholarship, National scholarship programme and Minority scholarship, minimum Rs. 6000 & maximum Rs. 100000 amount students receives Scholarship. Students get Opinion given by stakeholders regarding eligibility for application of Scholarship were distinction in previous class, cast, performance of student, schedule caste & schedule tribe, income status and minority status, time taken for process of scholarship were 2 to 3 months said by 32%, 6 months to 1 year by 49%, 6 months by 11% and more than 10 months answered by 8% of stakeholders, few of principals said that students receive Scholarship for complete course if they maintain good score. 87% of stakeholders highlighted on criteria for utilization of Scholarship as per merit and overall performance for paying fees where as 13% of them answered students use amount for hostel & food.

Questionnaires on view about publication where answered by stakeholders i.e. publication helps for professional and personal development.

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Conclusion: Assessment of a opinion of Nursing stakeholder on publications will make clear understanding about publications, importance of publication & funding and scholarship will be helpful for students.

Keywords: Opinion Nursing stakeholder; Publications; Scholarship.

INTRODUCTION

The common identified stakeholders in nursing are students, clinicians, educators, nurse managers. Stakeholders in healthcare system has importance because they keep the healthcare system up to date with the latest health progress and contribute to a service that is within the social interest. Stakeholders are major supporting system to support students and researchers in the form of scholarship.[1]

Aim of the study: To assess the opinion of Nursing stakeholder on publications & to assess the opinion of Nursing stakeholder on scholarship

Method & Material: This was a quantitative descriptive survey study of 50 samples from different states, aged 28-48 years both male and female Head of the Institutes, Ph.D. Nursing scholars, Professor and Nursing Educator with qualification of M.Sc. Nursing, P.B.BSC and PH.D. Nursing.

Non-probability purposive sampling technique was used for the selection of samples. To obtain necessary data for the study, the tool used for data collection was divided into section I - Demographic data, Section-II assessment for opinion of Nursing stakeholder on publications and Section-III assessment for opinion of Nursing stakeholder on scholarship.[2-4]

RESULT

1. The findings of sample characteristics:

Samples were from age group of 28 to 48 years. 36% Male &, 64% female working in different Nursing Institutes and hospitals from different states of like Maharashtra, Jammu Kashmir, Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Kerala, Uttarkhand and Karnataka. Majority of samples were shown area of interest for Research i.e. clinical 58%, Gynecology 19%, body organ donation 4%, Neurology 12% and managerial 7%. 78% participants published their researches papers in peer review journals, Web of Science, UGC care & Scopus where as 12% don't publish their research papers. 50% participants given information that students receive Scholarship & 50% don't receive scholarship. Type of different scholarship received by students were Tata, SC and ST scholarship TNAI, BPL scholarship, National scholarship programme and Minority scholarship, minimum Rs 6000 & maximum Rs 100000 amount students receives Scholarship. Students get.

2. Finding of opinion given by stakeholders regarding scholarship:

Opinion given by stakeholders regarding eligibility for application for scholarship were distinction in previous class, cast, performance of student, schedule caste & schedule tribe, income status and minority status, time taken for process of scholarship were 2 to 3 months said by 32%, 6 months to 1 year by 49%, 6 months by 11% and more than 10 months answered by 8% of stakeholders, few of Principals said that students receive Scholarship for complete course if they maintain good score.

87% of stakeholders highlighted on criteria for utilization of scholarship as per merit and overall performance for paying fees where as 13% of them answered students use amount for hostel & food.

3. Finding of Opinion given by stakeholders regarding Publications:

Questionnaires on view about publication where answered by stakeholders i.e. publication helps for professional and personal development. Publication will make our findings to reach maximum people and generalization of the topic. It's good for professional and personal growth, Publication improve knowledge be must be funded if done on a larger scale.

The students are involved in Publications answered by 94% participants i.e. students who have done projects in according to their curriculum like Diploma, Degree, and PG students 56% of article published in National, International journals, UGC, web of science where as 44% said they uploads their articles in Google scholar and publish ACTA health Sciences Journal.

61% of stakeholders were aware of types of web of science, Scopus, UGC care list Journals where as 39% are not aware about this. Majority of stakeholders answered on Publications cost is around Rs. 5000 to Rs. 7000, Web of science Rs. 8500, international journal Rs. 20000 and Scopus asks for funds way beyond limits that is why we publish in other journal's who ask for less.

75% of participants said time taken for publication was 2 to 3 months and 1 month.

73% of organizations don't have Research Review Committee where as 27% of organizations don't have Research Review Committee.

Opinion of student's publication, Yes they need to do publications. It's good for students; they get ideas of publication, and increase knowledge, It helps students to gather more information regarding research, must be sponsored to generate develop their interest towards our field as it is mostly a borrowed science answered by 89% of participants.

Opinion about individual & group publication, Both are good, For individual it's going personal name, and group members are involved doesn't matter as long as we deliver goods 80% given their views.

DISCUSSION

87% of stakeholders highlighted on criteria for utilization of scholarship as per merit and overall performance for paying fees where as 13% of them answered students use amount for hostel & food, similar study supported the findings that provision for scholarship and completion of nursing degree and their job placement, this depend on scholarship and funding were they actively involved in scholarly activities such as research (30,5% compared to 25,5%) and implementing best practice guidelines (62,2% compared to 55,9%).[5]

CONCLUSION

Assessment of a opinion of Nursing stakeholder on publications will make clear understanding about publication, importance of publication & funding and scholarship will be helpful for students.

Funding Source: There is no funding Source for this study

Conflict of interest: The authors certify that they have no involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this paper.

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Case Report

Role of Egg Membrane in Management of Chronic Wound: Our Experience Case Report

Nishad. K[1], Neljo Thomas[2], Ravi Kumar Chittoria[3], Barath Kumar Singh[4], Jacob Antony Chakiath[5]

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Abstract

Ulcer is defined as a discontinuity in the skin lining. It may be an acute or a chronic ulcer. Chronic wounds are associated with a difficulty in the healing process and a prolonged morbidity for the patient. There are different methods of providing wound coverage including flap coverage, skingrafting, temporary substitutes for dressing etc. In this article we have used egg membrane for healing of wound and have found it to be useful.

Keywords: Egg Membrane; Chronic wounds; Flap coverage; Skingrafting; Temporary substitutes.

INTRODUCTION

Non healing ulcers is a challenge for the plastic surgeon. There is a delay in wound healing due to various factors like presence of foreign material, lack of growth factors, lack of nutrition, underlying infection etc. and coverage can be given to such chronic wound after adequate wound bed preparation (WBP) by using various methods. Biological membranes are used in wound healing including human amnion, porcine xeno graft, alloderm etc. Egg membrane has been used as household remedy for wound healing in various parts of the world.

MATERIALS AND METHODS

This study was conducted in the department of Plastic Surgery at a tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient. The details of the patient are as follows: 37 year old female without any co morbidities with h/o road traffic accident 4 months back, underwent right below knee amputation due to a vascular injury and a degloving injury of the left lower limb for which serial debridement was done in cardiothoracic and general surgery department. Now, the patient presented to plastic surgery department with extensive raw area over the left lower limb and non-healing ulcer over the

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right below knee amputation stump. The regular dressing and skin grafting did not lead to wound healing and had left raw areas which did not heal completely. We used egg membrane for dressing for the raw areas.

Egg membrane was harvested by making the outer shell of the egg sterile by immersing in 70% alcohol for 5 minutes. The egg was broken and contents discarded. The egg membrane between the egg shell and the contents was sterilised by immersing in penicillin or gentamicin. The egg membrane was applied over the wound. Repeat dressings are done on post-operative day 5 and on the subsequent alternated days till 4 dressings.

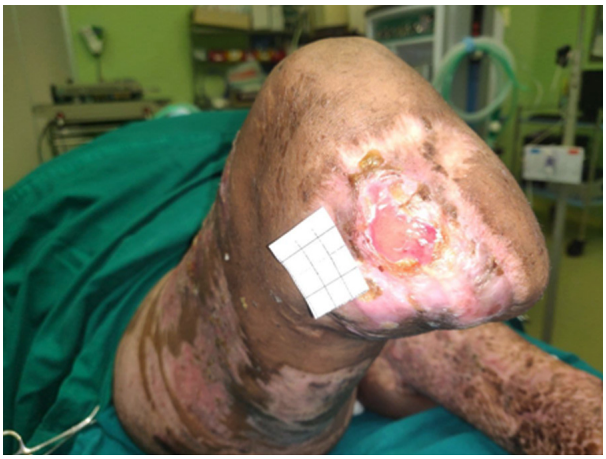

Fig. 1: Non healing ulcer

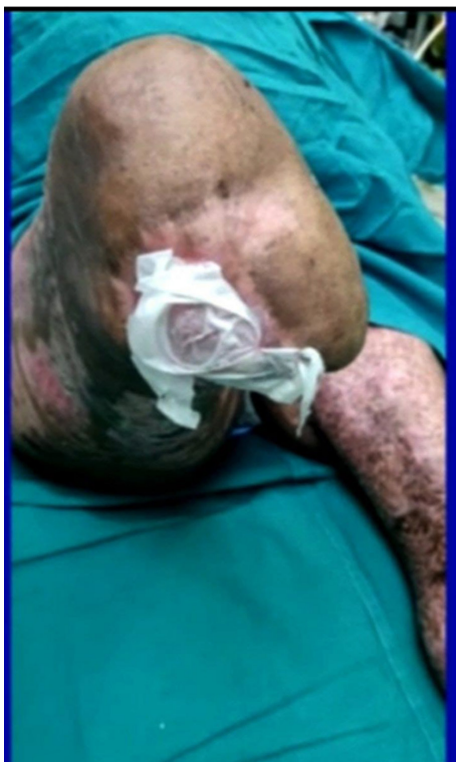

Fig. 2: Egg membrane treatment

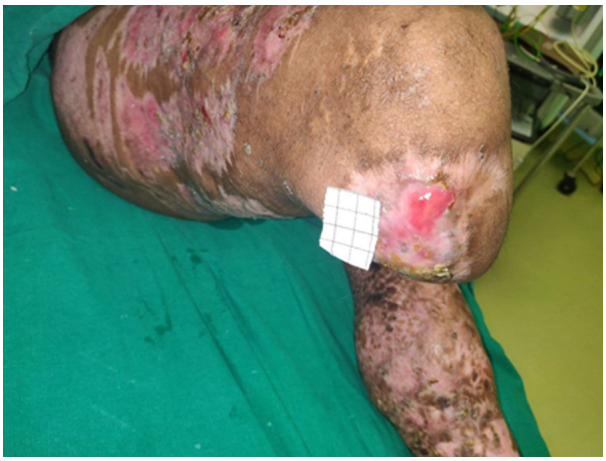

Fig. 3: After egg membrane treatment

RESULTS

There was good wound healing of the recipient areas of the wound alongwith good healing of the donor areas.

DISCUSSION

An ideal wound dressing is one which can provide anenvironment suitable for rapid infection free healing, cause minimal pain, and require minimal care. Although some commercial synthetic or compositematerials meet these requirements, they are expensive and not very user friendly. Among biological dressings, human amniotic membranes are useful in partial thickness skin wounds as a temporary dressing thatcan promote reepithelialisation. However, Ungerand Roberts found delayed healing time without significant reduction in when using lyophilized amniotic membranes to 8 skingraft donor sites.[1], amniotic membranes are not used as dressings extensively because of their potential threat of human disease transmission.[2,3] Inclinical applications, amniotic membranes are fragile, difficult to use, become easily macerated, and are not readily available,[4] Porcine skin is another material that has been used as a biological dressing. However, as Salisbury et al.[5], when porcine xenografts were incorporated into the wounds of patients, it lead to pronounced inflammatory responses and a prolonged healing time. Cadaver skin is difficult to obtainin Oriental countries due to lack of donors. Finally, collagen sheets become easily macerated; excessive wound discharge occurs; and the material is useful for superficial donor site wounds.[6,7] Egg membrane, the protective covering for chicken embryos, is a mixture of protein and glycoprotein. Egg membrane was first used in clinical trials in 1981,

as described by Maeda and Sasaki.[8] Maeda and Sasaki presented 3 cases with epithelialization and concluded that egg membrane is an in expensive and a reliable biological dressing. Egg membrane is thin (60-70 µm), highly collagenized fibrous connective tissue comprised of both an inner and an outer layer. Egg membrane iscomprised mainly of protein, making up 88%-96% of dry weight[9], and its unique structure provides adhesion and vapor transmission. Egg membrane is a cell membrane sheet that without a nuclear DNA. Theoretically, egg membrane has very less antigenecity.

CONCLUSION

Egg membrane can be used as treatment of non-healing ulcers with minimal donor site morbidity.

DECLARATIONS

Acknowledgment

Authors' contributions: All authors made contributions to the article.

Availability of data and materials: Not applicable.

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Conflicts of interest: None.

Consent for publication: Not applicable.

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[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006; 35: 540–7.

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Article in supplement or special issue

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Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979–2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7–18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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