it's TIME to care

infermieristica journal / **April 2023** / Volume 2 Number 1

ISSN 2785-7034 - Trimestrale - Poste Italiane SPA - Sped. abb. post. - D.L. 353/2003 (conv. in L. 27/02/2004 n. 46) art. 1 comma 1, DCB, Roma - 30,00 €

infermieristica Editore

FIRENZE UNIVERSITY PRESS

Manifesto

infermieristica journal (ij) is an international peer-reviewed scientific journal that promotes the development and exchange of knowledge relevant to nursing research and practice. ij supports evidence-based clinical practice, encourages, and promotes critical debate about the art and science of nursing.

The journal particularly welcomes studies that aim to evaluate and understand complex health care interventions and health policies, and which employ the most rigorous designs and methods appropriate for the research question of interest. The journal also seeks to advance the quality of research by publishing methodological papers introducing or elaborating on analytic techniques, measures, and research methods. The journal publishes original peer-reviewed articles of interest to the international health care community.

The editorial policies of ij include:

- Rapid initial screening for suitability and editorial interest;
- Highly efficient editorial processes: average time from submission to first decision of 2 months;
- Just Accepted Manuscript: the article is published online soon after its acceptance;
- Indexed of journal in scientific databases.

Editorial Office
Contact Information
info@infermieristicaj.it.

Subscriptions
infermieristicaj.it/en/sub

Advertise & Partnership
infermieristicaj.it/en/advertise

Reprints
info@infermieristicaj.it.

Online
www.infermieristicaj.it

Print
Tipografia Grafiche Martelli (Florence)

Editors
infermieristica Editore (iE)
Firenze University Press (FUP)

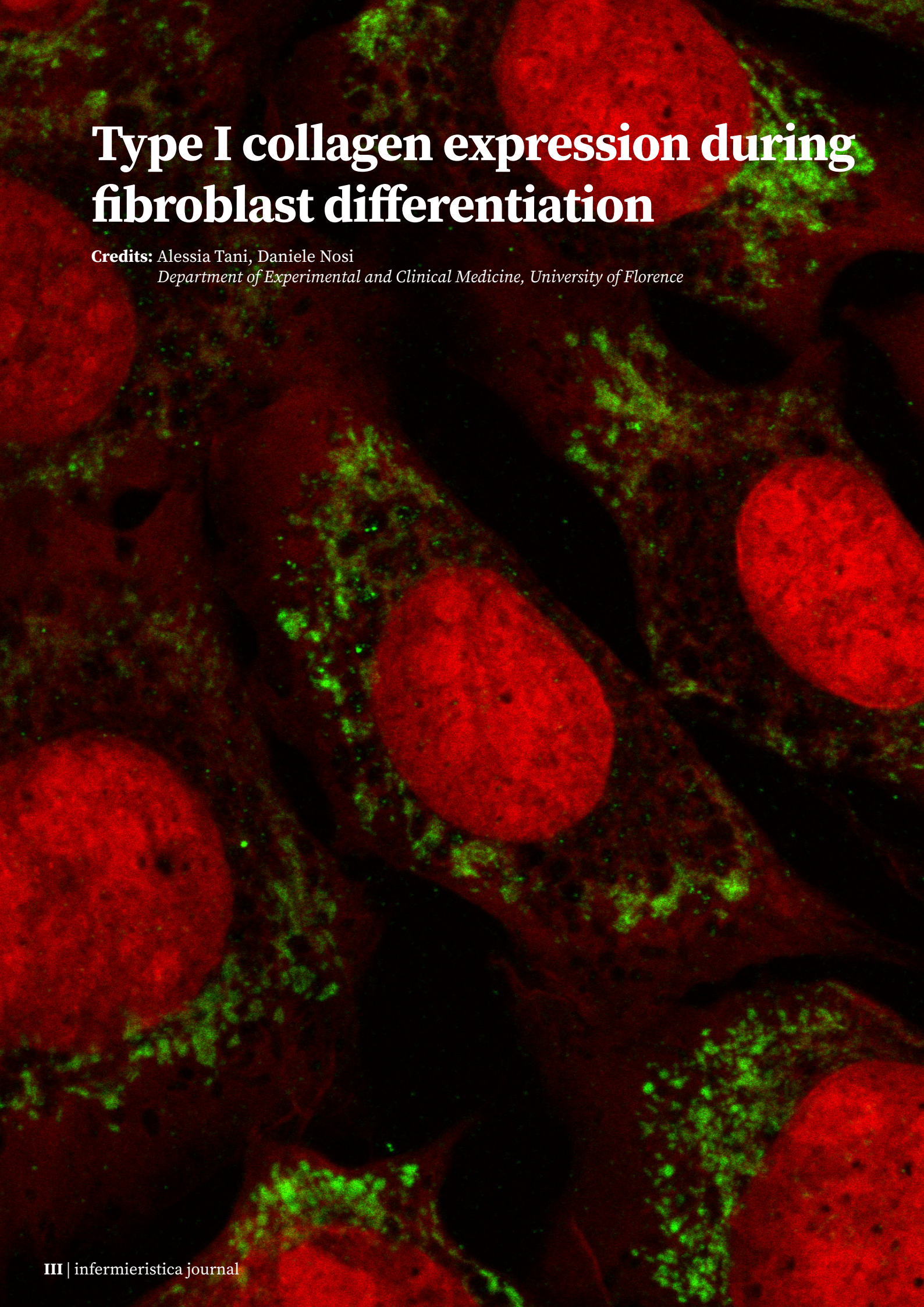
infermieristica journal is pending registration at the Court of Florence.

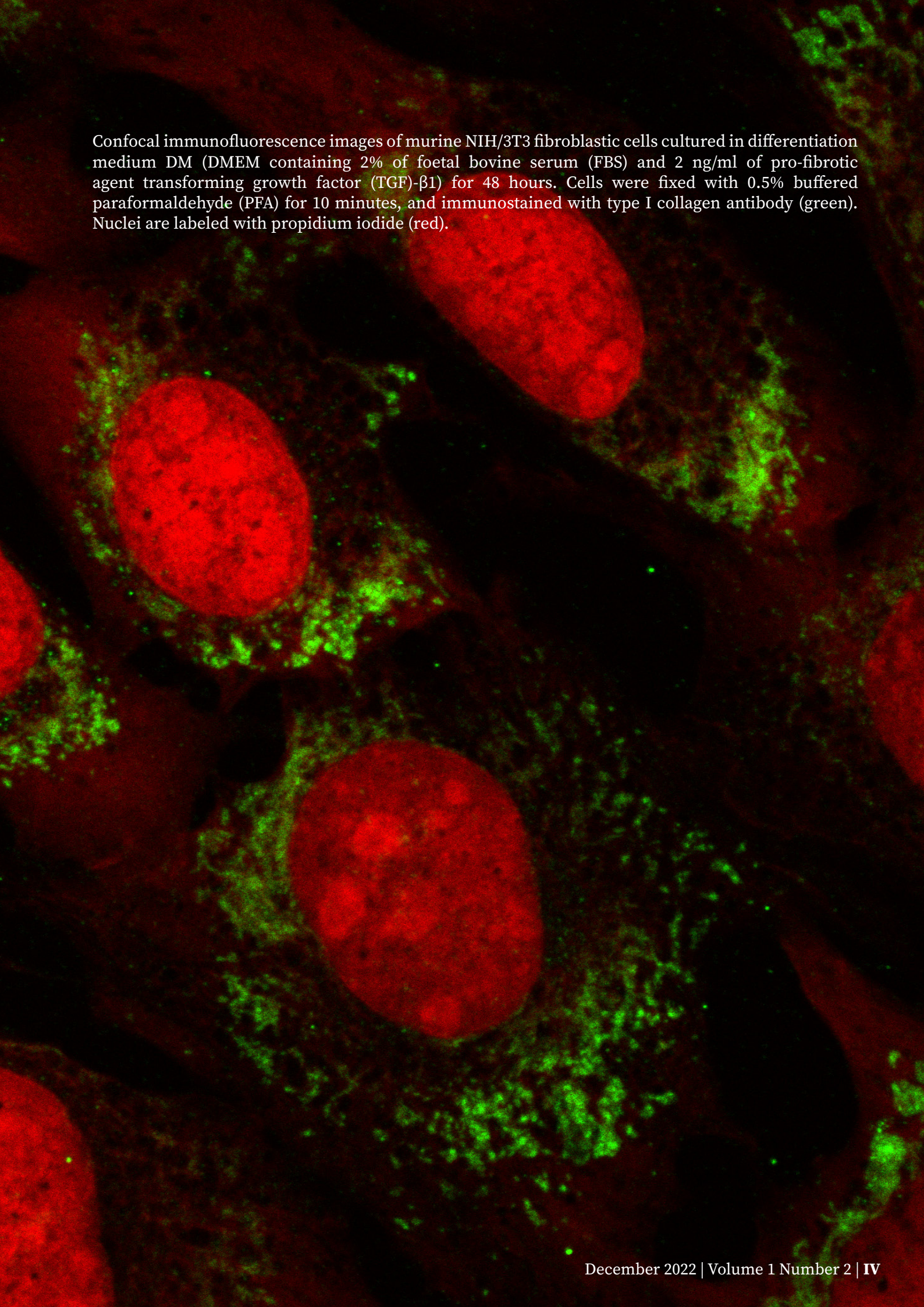
infermieristica journal

April 2023 Volume 2 Number 1

Type I collagen expression during fibroblast differentiation

Credits: Alessia Tani, Daniele Nosi
Department of Experimental and Clinical Medicine, University of Florence





Confocal immunofluorescence images of murine NIH/3T3 fibroblastic cells cultured in differentiation medium DM (DMEM containing 2% of foetal bovine serum (FBS) and 2 ng/ml of pro-fibrotic agent transforming growth factor (TGF)-β1) for 48 hours. Cells were fixed with 0.5% buffered paraformaldehyde (PFA) for 10 minutes, and immunostained with type I collagen antibody (green). Nuclei are labeled with propidium iodide (red).

Editorial

Assistance to the wound care patient: a challenge still open

Sebastian Probst[1], **Laura Stefanon**[2]

[1]*President of European Wound Management Association (EWMA)*
[2]*President of Associazione Infermieristica per lo Studio delle Lesioni Cutanee (AISLeC)*

Wound care used to be more of an art than a science, but thanks to contributions from different disciplines, wound healing is now firmly based on science and clinical evidence in a holistic view of the patient. This means not only focusing on the specific wound requiring treatment, but also trying to observe and understand the overall health of our patient. Such an approach requires a range of skills coming from discipline as medicine, physiology, psychology, engineering and patient care.

The management of the patient with skin lesions, a subject that is often underestimated, requires targeted and timely interventions through the creation of specialised and multidisciplinary teams that can accompany the person throughout his or her treatment, guaranteeing equity of treatment.

In Italy, the situation is uneven, and citizens from different regions often do not have the same access to the treatments delivered by the healthcare system. By comparing the different care pathways for patients with skin wounds, we can highlight the level of equity and accessibility of care in the national context and raise awareness for the implementation and improvement of healthcare services.

The incidence of skin lesions in hospitalised people ranges from 4 to 9% and increases by 10-25% in the elderly. It is often the primary cause of hospitalisation, as in the case of diabetic foot, burns, reconstructive surgery or lower extremity injuries due to vascular problems.

The epidemiological evolution of healthcare needs and problems highlights the increase and transversality of users with skin injuries; for example, in the home setting, more than 2/3 of the home care requests is related to the management of skin injuries. This highlights the need for healthcare professionals with appropriate skills and abilities to manage an injury through the wound care best practice.

Chronic wounds represent a major public health challenge in Italy and abroad. In fact, there are common problems to be faced by the healthcare professionals: heterogeneity of tools, criteria and monitoring systems, assessment of appropriateness of choice and treatment, diagnostic and therapeutic pathways and continuity of care, development and maintaining of expertise and special skills, as well as the creation of multidisciplinary teams, and access to medical equipment.

The various associations and scientific societies also aim to develop special skills, improve care pathways, develop research and disseminate evidence-based best practice in collaboration with institutions, professional bodies and patient groups.

AISLeC, Associazione Infermieristica per lo Studio delle Lesioni Cutanee (Nursing Association for the Study of Skin Lesions), is an interdisciplinary association entirely dedicated to the study and research of skin lesions of various aetiologies and is the first Italian scientific society to develop actions in the field of wound care. Celebrating 30 years of activity, AISLeC acts as a scientific reference point, developing the skills of professionals by emphasising innovation and research, and promoting appropriate dissemination not only among professionals but also among institutions and citizens.

AISLeC's choice is to promote the value and importance of science in the training of professionals as a guide to clinical and organisational decision making, and to pursue the development of integration of skills and multidisciplinarity as essential in the management of skin wounds.

The European Wound Management Association (EWMA) also aims to promote the implementation of high quality, interdisciplinary and cost-effective wound

care in order to address the problem of skin wounds in a comprehensive manner. To achieve its objectives, EWMA acts as an educational resource, organises conferences, contributes to international wound management projects, actively supports the implementation of existing wound management knowledge and provides information on all aspects of wound management.

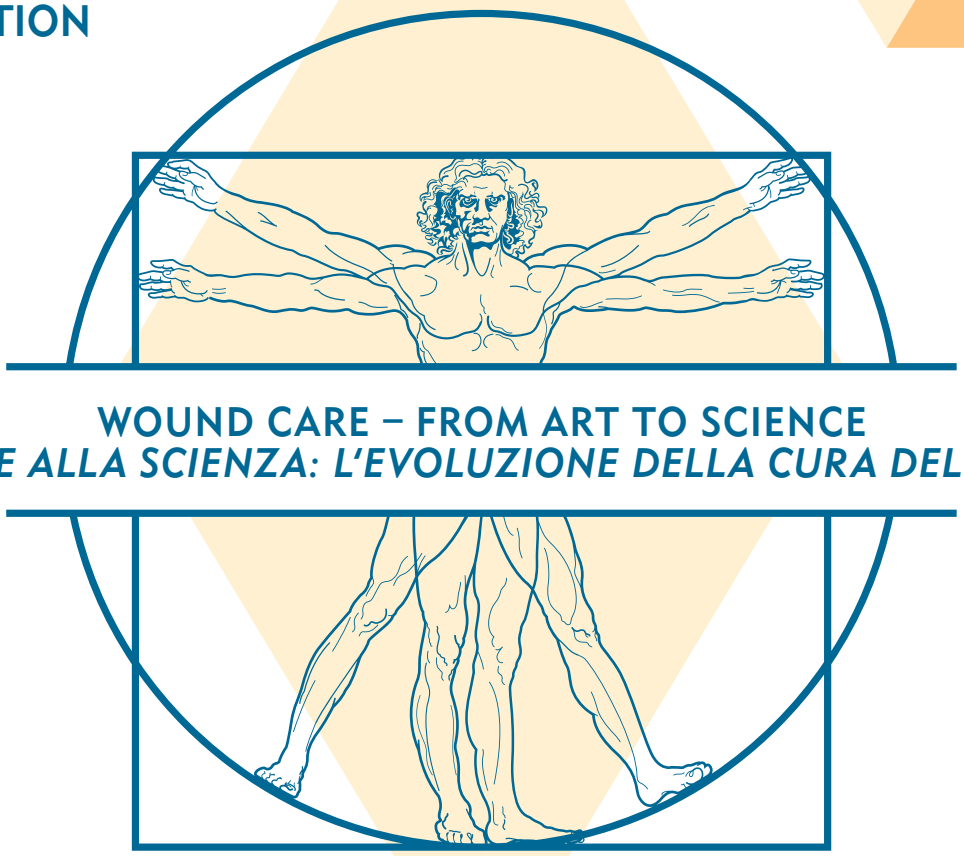
The European Congress is another opportunity to take stock of what has been achieved in the field and what we can achieve in the future.

The theme of this year's congress, Wound care - from art to science, will be held in Milan from 3 to 5 May. The conference is organised together with the Nursing Association for the Study of Skin Lesions (AISLeC) and in collaboration with the Italian Association of Cutaneous Ulcers (AIUC). During the conference, participants can attend to scientific sessions with a mix of new topics of importance to the European wound community, as well as topics that have been successful at previous EWMA conferences.

We look forward to seeing many of you in Milan from 3-5 May.

EWMA 2023

THE 33RD CONFERENCE OF THE EUROPEAN WOUND MANAGEMENT ASSOCIATION



WOUND CARE – FROM ART TO SCIENCE
DALL'ARTE ALLA SCIENZA: L'EVOLUZIONE DELLA CURA DELLE FERITE

EUROPEAN · WOUND · MANAGEMENT · ASSOCIATION
EWMA

AISLEC

OTHER COLLABORATORS

AIUC

MILAN, ITALY
3 – 5 MAY 2023

@EWMAWOUND

EWMA2023.ORG

WHY ATTEND?

- BUILD YOUR NETWORK AND MEET THOUSANDS OF PEERS AND COLLEAGUES AT THE WORLD'S LARGEST WOUND CARE EVENT

MORE THAN 100 SCIENTIFIC SESSIONS

- GET THE LATEST KNOWLEDGE BY ATTENDING KEY SESSIONS, FOCUS SESSIONS, HANDS-ON WORKSHOPS AND SYMPOSIA

OVER 100 WOUND MANAGEMENT COMPANIES

- MEET WITH THE INDUSTRY AND GET UPDATED ON ALL THE NEWEST DEVELOPMENTS AND WOUND CARE PRODUCTS

MORE THAN 80 COUNTRIES REPRESENTED

- NETWORK WITH PEER RESEARCHERS AND CLINICIANS FROM AROUND THE WORLD

IMPORTANT DATES:

CONFERENCE DATES: 3 - 5 MAY 2023

ABSTRACT SUBMISSION OPENS: SEPTEMBER 2022

REGISTRATION OPENS: SEPTEMBER 2022

ABSTRACT SUBMISSION DEADLINE: 1 DECEMBER 2022

EARLY REGISTRATION DEADLINE: FEBRUARY 2023

Case Series

Blue Light Photobiomodulation as treatment for peristomal skin disorders: case series

Citation: Antonini M. , Gasperini Stefano. "Blue Light Photobiomodulation as treatment for peristomal skin disorders: case series" (2023) *infermieristica journal* 2(1): 5-10. DOI: 10.36253/if-2070

Received: February 23, 2023

Revised: March 3, 2023

Just accepted online: March 22, 2023

Published: April 30, 2023

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Antonini Mario[1], Gasperini Stefano[2]

[1]Stomal Therapy Nurse, USL 11 Ospedale San Giuseppe, Empoli, Italy
[2]MD, Medical Advisor, Pisa, Italy

Abstract: **Introduction.** Keeping the peristomal skin intact proves to be a challenge for stoma patients and the health care teams that work with them. Peristomal skin complications are shown to affect 36.3% to 73.4% of patients. They are often particularly difficult to treat with topical therapies since the topical medications available are cream-based or ointment type formulations that don't allow for perfect adhesion of the pouching system to the abdomen's skin. In this study a preliminary evaluation of the effectiveness of Blue Light Photobiomodulation in the treatment of peristomal skin disorders was performed.
Methods. Patients carrying ostomy with lesions of types L2, L3, L4, L5, LX (SACS 2.0 classification5) that had not experienced an improvement in 4 weeks of standard therapy were selected for Blue Light therapy. Blue Light treatment was performed twice a week for 4 weeks, in addition to standard therapy. Tissue repair was evaluated through Wound Bed Score and pain reduction.
Results. All the 11 patients enrolled responded to Blue Light treatment with an average WBS improvement of 8.3 points and a significant reduction in pain. Blue Light Photobiomodulation to be decisive in activating the healing process in three patients with pyoderma gangrenous.
Conclusions. The positive clinical results suggests that Blue Light Photobiomodulation could be a promising tool in the management of peristomal skin lesions.

Keywords: Peristomal Skin Disorders, Photobiomodulation, Blue Light, Wound Bed Score

Introduction

Peristomal skin disorders are common postoperative complications in people who undergo surgical procedures resulting in enterostomal formation[1]. They usually occur within the first two weeks of the creation of the stoma but they can also present as late complications, months or even years after the initial surgery[1]. Complications range from mild irritation to full thickness ulcerations and the international literature refers to an incidence ranging from 36.3% to 73.4% for such alterations[2]. Peristomal skin alterations represent a significant problem both for stoma patients' quality of life and for the health care system, as peristomal

skin lesions are the main reason for which stoma patients visit outpatient clinics, and, in severe cases of peristomal skin complications, costs for a patient with a stoma increases from two to five times[3]. The therapeutic approach ranges from using different pouching systems, to topical, systemic medications and surgery, and should be chosen according to the underlying cause of the complication1. According to international literature, 77% of diagnosed skin disorders are related to contact with stoma effluent[4]. To avoid this, it is essential that the ostomy bag remain attached to the patients' abdomen. One of the main limitations in the treatment of peristomal skin alterations is the lack of appropriate topical therapies since the topical medications available are cream-based or ointment type formulations that don't allow for perfect adhesion of the pouching system to the abdomen's skin[5]. Photobiomodulation has been shown to promote several therapeutic effects, including the mitigation of pain and inflammation, immunomodulation and promotion of tissue regeneration and healing[6]. For this reason, we have decided to apply PBM with Blue Light as new, non-invasive, contactless therapy on patients under treatment for peristomal skin complications at San Giuseppe Hospital, Empoli, Italy.

Patients and methods

This case series focuses on patients carrying ostomy with skin complications of types L2, L3, L4, L5, LX (SACS 2.0 classification[7]) that had not experienced an improvement in 4 weeks of standard therapy were included. According to the SACS 2.0 a skin complication classified as L2 is an erosive lesion with loss of substance as far as and not beyond the basal membrane; L3 is an ulcerative lesion beyond the basal membrane; L4 is an ulcerative fibrinous/necrotic lesion; L5 is an ulcerative lesion involving planes beyond the muscular fascia (with or without fibrin, necrosis, pus or fistula); LX is a proliferative lesion (neoplasia, granulomas, oxalate deposit). The reported clinical observations were the result of a product test, authorized by the Hospital. All patients have been asked for informed consent. Treatment was performed in addition to standard therapy, twice a week, for 120 seconds in cases of inflammatory lesions (such as pyoderma gangrenous) or for 60 seconds in all other cases; Blue Light therapy duration was 4 weeks. Tissue repair was evaluated through two parameters: Wound Bed Score (WBS)[8] and pain. The WBS is a classification system that has proven to have validity in predicting complete wound closure and in clinical practice is considered a useful tool to support adequate wound bed preparation, essential for the healing. Pain was measured through the Visual Analogue Scale (VAS). At the enrollment visit and during the check-up visit, 3 days after the last Blue Light treatment, photographic images were collected and data for WBS and VAS were recorded on a specific patient data form. For Blue Light PBM was used a portable medical device (EmoLED), equipped with LED sources emitting blue light in the interval of 400-430 nm, with a power density of 120 mw/cm^2 and a fluence of 7,2 J/cm^2, at 4 cm from the skin lesion.

Results and discussion.

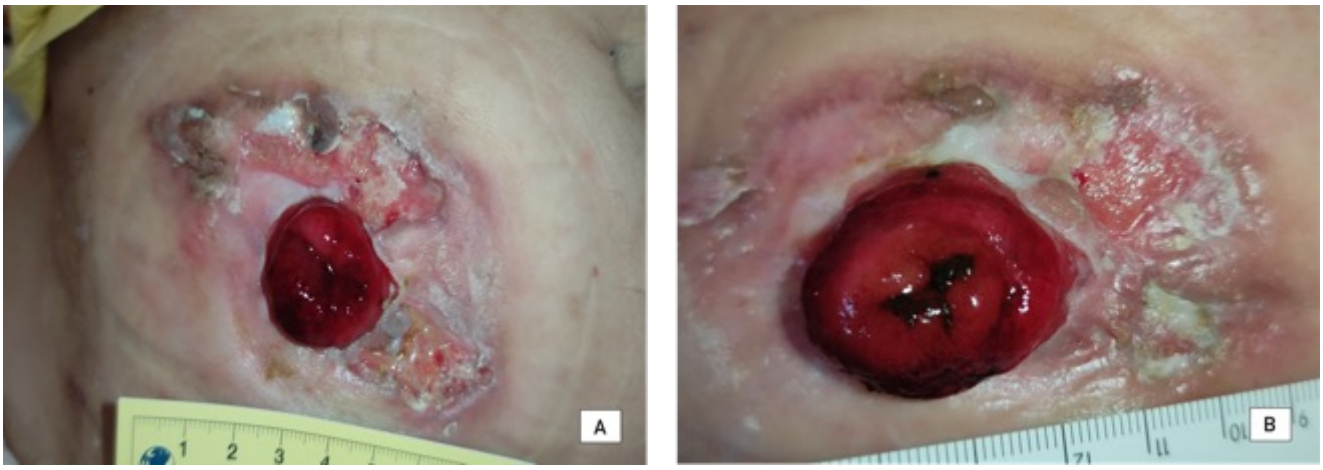
11 patients were enrolled. All patients responded to Blue Light treatment with an average WBS improvement of 8.3 points and a significant reduction in pain. Classification of the skin complications according to SACS 2.0 for each patient is reported in Table 1; in the table is also reported the quadrant of the abdominal region around the stoma where the skin complication was localized (T1=upper right; T2=upper left; T3=lower left; T4=lower right; T5=total). At the enrollment visit the average WBS was 5.9 (range 5-8) and the average VAS score was 5.4 (range 3-8). At the check up visit the average WBS had increased to 14.2 (range 10-16), where the maximum possible score (best score) is 16, and the average VAS value had dropped to 1.9 (range 0-3). The results obtained by each patient are reported in Table 1. Three clinically interesting cases of patients who had developed pyoderma gangrenosum are presented in figures 1, 2 and 3; pyoderma gangrenosum is a very painful ulcerations requiring a specific topical approach; in all three cases, Blue Light Photobiomodulation proved decisive in activating the healing process.

Tab 1 - Rating of the 16-items tool by five panelists; CVI: content validity index

Patient	Sex	Age (years)	Patology	Type of ostomy	
1	F	73	Rectal cancer	Ileostomy	
2	M	35	Diverticulum perforation	Left colostomy	
3	M	76	Right colon cancer	Ileostomy	
4	F	46	Rectal ulcerative colitis	Ileostomy	
5	F	67	Colorectal cancer anastomosis dehiscence	Ileostomy	
6	F	68	Rectal cancer	Ileostomy	
7	F	77	Rectal cancer Short bowel syndrome	Ileostomy	
8	M	51	Chron disease	Ileostomy	
9	M	80	Sigmoid colon cancer	Ileostomy	
10	M	77	Bladder cancer	Left ureterocutaneostomy	
11	M	88	Bladder cancer	Monolateral ureterocutaneostomy	

Figure 1 – Patient 4

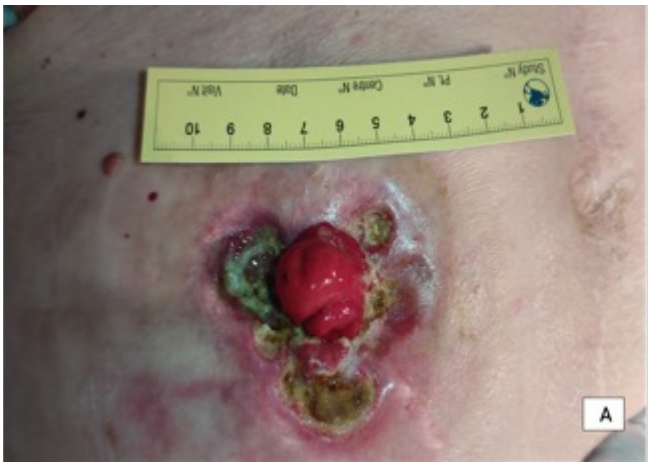
A 46 years-old woman, who underwent total proctocolectomy for Ulcerative Colitis, with ileostomy formation and, subsequently, surgery and chemotherapy for breast cancer. Peristomal pyoderma gangrenous with presence of intense pain (developed during chemotherapy).
(A) Pyoderma gangrenous at enrollment; (B) The lesion after 4-weeks of standard therapy (cleansing with polyhexanide and betaine-based solution + Clobetasol ointment + protease-modulating matrix + Methylprednisolone (16mg) + Blue Light treatment (120 seconds twice a week).



	Peristomal Skin Complications					
	Classification (SACS 2.0)	**Timing after surgery (days)**	**WBS enrollment**	**WBS check-up**	**VAS enrollment**	**VAS check-up**
	L3 T2-4	3	5	16	3	2
	L3 T4	2	7	15	5	2
	L2 T3-4	3	6	15	6	2
	L3 T1-2-3	51	6	13	7	1
	L2 T1	7	5	14	3	2
	L4 T2-3-4	55	5	16	8	3
	L2 T3	55	7	13	8	2
	L4 T3	14	5	13	8	2
	L4 T4	15	6	15	5	2
	L2 T4	10	8	16	3	0
	LX T3-4	7	5	10	5	3

Figure 2 – Patient 6

A 68-year-old woman who underwent surgery for rectal cancer with sided ileostomy formation. Peristomal pyoderma gangrenous not responding to any therapy.
(A) Pyoderma gangrenous at enrollment; (B) The lesion after 4-weeks of standard therapy (cleansing with polyhexanide and betaine-based solution + Clobetasol ointment + protease-modulating matrix) + Blue Light treatment (120 seconds twice a week).



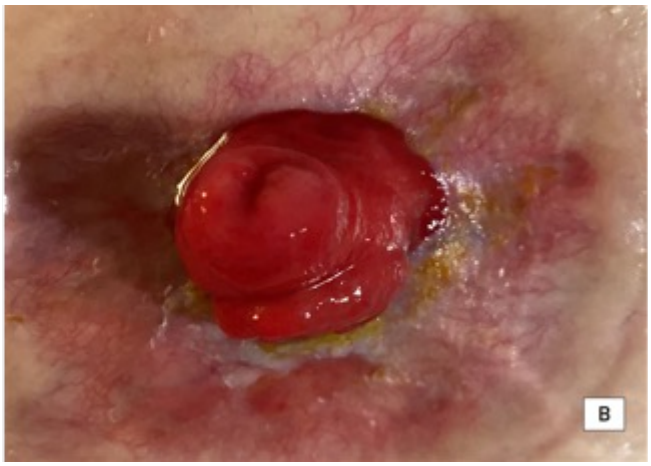
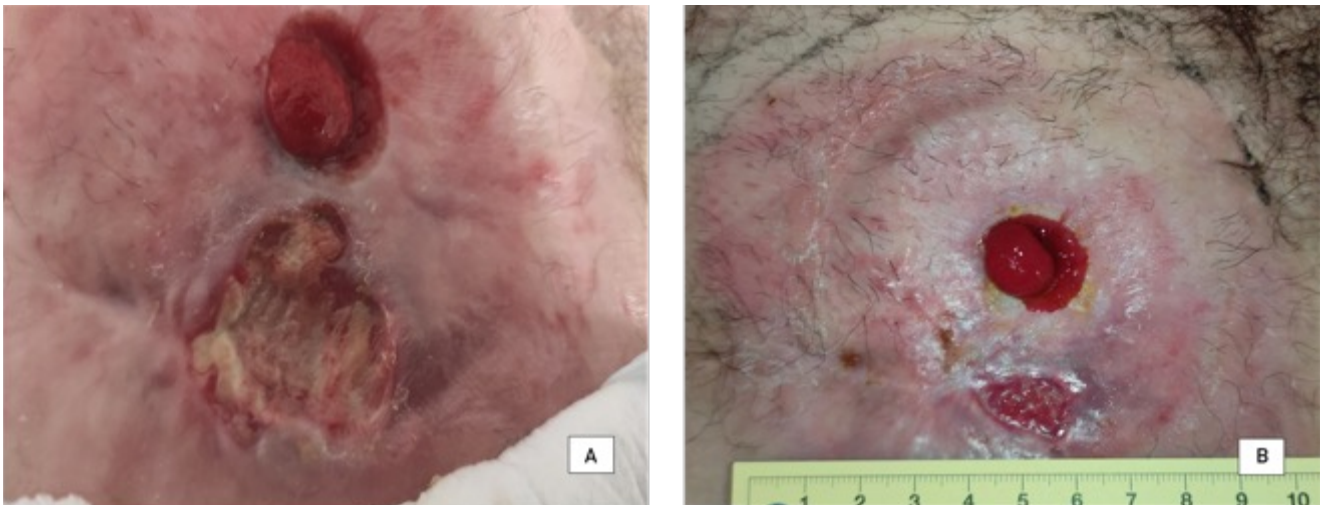


Figure 3 – Patient 8

A 51-year-old man who underwent total proctocolectomy for Chron's disease with ileostomy formation. Recurrent lesions recognized as pyoderma gangrenous.
(A) Pyoderma gangrenous at enrollment; (B) The lesion after 4-weeks of standard therapy (cleansing with polyhexanide and betaine-based solution + Clobetasol ointment + protease-modulating matrix) + Blue Light treatment (120 seconds twice a week).



The term Photobiomodulation6 define "a form of light therapy ... eliciting photophysical and photochemical events at various biological scales". A growing body of evidence supports the positive effects of Photobiomodulation on wound healing. Blue light PBM has been shown to modulate the oxidative state of Cytochrome C and thus influence the process of cellular respiration, which is more essential than ever in cells involved in tissue repair[9,10]. Furthermore, Blue Light acts on inflammation by stimulating a more rapid transition; this effect has been demonstrated in preclinical studies where early arrival of inflammatory infiltrate cells in the wound bed and an acceleration of the phenotypic switch of macrophages (M1 to M2), marking the transition to the proliferative phase, has been recorded in treated wounds[11,12]. These effects of Blue Light PBM are considered to be primally responsible for wound healing. Previous clinical results showed that Blue Light effectively promoted wound healing and reduced pain in patients with venous ulcers, vasculitis and traumatic wounds that did not respond to standard treatments[13,14,15]. In our experience, Blue Light PBM, in 4 weeks of therapy, has reactivated the healing of peristomal skin complications that did not respond to the standard therapy.

Conclusions

Blue Light Photobiomodulation is a non-invasive, safe, fast, and easy to perform therapy, non-interfering with the adhesion of the pouching system. In our experience Blue Light treatment has promoted the healing process and reduced pain of peristomal skin complications. Blue Light therapy can contribute to the management and healing of peristomal skin disorders, bringing a significant benefit to the quality of life of patients and to the economic sustainability of the healthcare system. Further investigations will be necessary to confirm our preliminary results.

References

1. Doctor K, Colibaseanu DT. Peristomal skin complications: causes, effects, and treatments. Chronic Wound Care Management and Research. 2017;4:1-6.
2. D'Ambrosio F, Pappalardo C, Scardigno A et al. Peristomal Skin Complications in Ileostomy and Colostomy Patients: What We Need to Know from a Public Health Perspective. Int J Environ Res Public Health. 2022 Dec 21;20(1):79.
3. Meisner S, Lehur P-A, Moran B et al. Peristomal skin complications are common, expensive and difficult to manage: a population-based cost modeling study. PLoS ONE 2012; 7(5): e37813.
4. Herlufsen P, Olsen AG, Carlsen B et al. Study of peristomal skin disorders in patients with permanent stoma. British Journal of Nursing 2006 15:16, 854-862
5. Antonini M, Arena R, Mancini S et al. Peristomal skin changes: what treatment should be adopted? Results of an observational multi-centre study. WCET Journal, Volume 38 Number 1 Jannuary/March 2018, (30-34).
6. Anders JJ, Lanzafame RJ, Arany PR. Low-level light/laser therapy versus photobiomodulation therapy. Photomed Laser Surg. 2015 Apr;33(4):183-4.
7. Antonini M, Militello G, Manfredda S et al. et al A revised version of the original SACS Scale for Peristomal Skin Disorders Classification. WCET Journal, Volume 36 Number 3. July/September 2016, (22-29).
8. Schultz GS, Sibbald RG, Falanga V et al. Wound bed preparation: a systematic approach to wound management. Wound Repair Regen. 2003 Mar;11 Suppl 1:S1-28.
9. Magni G, Banchelli M, Cherchi F et al. Experimental Study on Blue Light Interaction with Human Keloid-Derived Fibroblasts. Biomedicines. 2020 Dec 6;8(12):573.
10. Rossi F, Magni G, Tatini F et al. Photobiomodulation of Human Fibroblasts and Keratinocytes with Blue Light: Implications in Wound Healing. Biomedicines. 2021 Jan 5;9(1):41.
11. Cicchi R, Rossi F, Alfieri D et al. Observation of an improved healing process in superficial skin wounds after irradiation with a blue-LED haemostatic device. J Biophotonics. 2016 Jun;9(6):645-55.
12. Magni G, Tatini F, Siena G et al. Blue-LED-Light Photobiomodulation of Inflammatory Responses and New Tissue Formation in Mouse-Skin Wounds. Life (Basel). 2022 Oct 9;12(10):1564.
13. Dini V, Romanelli M, Oranges T et al. Blue light emission in the management of hard-to-heal wounds. Ital J Dermatol Venerol. 2021 Dec;156(6):709-713.
14. Fraccalvieri M, Amadeo G, Bortolotti P et al. Effectiveness of Blue light photobiomodulation therapy in the treatment of chronic wounds. Results of the Blue Light for Ulcer Reduction (B.L.U.R.) Study. Ital J Dermatol Venerol. 2022 Apr;157(2):187-194.
15. Marchelli M, Perniciaro G, Granara D et al. Photobiomodulation with Blue Light in non-healing wounds: case series evaluation. Wounds International 2019, Volume 10 Issue 3, pag 63-67

Diventa socio AISLeC

Perché AISLeC

- Guarda al futuro del wound care, alle esigenze dei pazienti e degli operatori
- Valorizza e favorisce lo sviluppo professionale
- Supporta nello sviluppo delle competenze cliniche e di ricerca attraverso la formazione e la pratica
- Ti rappresenta in Italia e all'estero

Perché tu, Professionista Sanitario, puoi

- Valorizzare e migliorare le tue competenze
- Affermare la specificità della tua professione
- Contribuire alle scelte dell'associazione
- Proporre nuovi progetti ed essere parte attiva dell'Associazione
- Partecipare a progetti di ricerca scientifica

L'iscrizione ad AISLeC ti garantisce

- Accesso ai documenti (es. articoli, linee guida etc.) nell'area riservata del sito web
- Aggiornamenti periodici sulle attività dell'Associazione
- Agevolazioni e promozioni sulle attività formative e sulle pubblicazioni AISLeC

PER ISCRIVERTI VISITA IL NOSTRO SITO!
www.aislec.it

AISLEC
ASSOCIAZIONE INFERMIERISTICA
PER LO STUDIO DELLE LESIONI CUTANEE
Società scientifica italiana a carattere interdisciplinare

E-mail **segreteria@aislec.it / aislec@pec.it**
Web **www.aislec.it**

Seguici!

INNOVAZIONE E RICERCA PER LA QUALITA' DELL'ASSISTENZA AI PAZIENTI CON LESIONI CUTANEE

Review

Stoma and peristomal complications: a rapid overview of the literature

Citation: Chirco C., Antonini M. "Stoma and peristomal complications: a rapid overview of the literature" (2023) *infermieristica journal* 2(1): 13-25. DOI: 10.36253/if-2075

Received: March 2, 2023

Revised: March 16, 2023

Just accepted online: April 10, 2023

Published: April 30, 2023

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Giorgia Chirco[1], Mario Antonini[1]

[1]Nurse, Don Carlo Gnocchi Foundation, Florence, Italy. (email: giorgiachirco1999@gmail.com)
[2]ET/Wound Care Nurse, Ostomy Rehabilitation Center (CE.RI.STOM) Azienda USL Toscana Centro, Empoli, Italy

Abstract: Complications of the stoma complex are estimated to occur in 20-70% of the ostomized population. These studies, however, appear to show contradictions in terms of definitions of the same complications, making the results of the analyses of the incidence and prevalence of the phenomenon inconsistent with each other. The absence of unambiguous definitions does not allow clear evidence to be defined in science; moreover, this is reflected in the absence of a standardized clinical-care approach, which inevitably hinders the spread of an organizational and methodological culture aimed at the wellness and autonomy of the subject.
To overcome this obstacle, different classifications of complications have been proposed throughout the years, differentiating these exclusively into macro-categories, without delving into them in detail. In this regard, this review aims to clearly define the individual complications of the stoma complex to provide nurses with an instrument that can help them in their prevention and recognition.

Keywords: Ostomy, Stoma complications, Peristomal complications, Stoma edema, Malpositioning, Malpacking, lesions, Proliferative lesions, Infections, atypia

Introduction

The presence of complications of the stoma complex is defined by the occurrence of unfortunate events that affect the stoma, mucocutaneous junction, and/or peristomal area, and that makes the management of the ostomy itself difficult or even exacerbate the health status of the subject.

These have been recognized as negative indicators for the health of the ostomy patient[1] and have been categorized in different ways. A study published in 2016, categorized them into surgical, psychological, and social complications[2]; another classification is related to the time of onset so that we can differentiate early complications, which develop within the first 72h after surgery, and late complications, which occur beyond 72h postoperatively[3]. The WOCN Society has separated stoma complex complications into two groups, stoma and peristomal complications[4].

Several studies have been conducted over the years regarding the complications of the ostomy complex, mainly related to the risk factors determining these and the incidence of complications in the ostomized population. However, these studies included in the literature show variable results, so the incidence rate of complications varies from 20% to 70%[5,6], and to date, the risk factors contributing to their occurrence

have not been defined with certainty[7]. Salvadalena G. in 2013[7] and later, Malik et al. in 2018[8], in their related studies, highlighted the most representative limitations of the studies up to that time submitted literature. Both of them agree on how incoherencies in terms of definitions and measurements of complications represent a major limitation in establishing clear evidence.

In this regard, this review aims to clearly define the complications of the ostomy complex and to provide nurses with an instrument that can help in the prevention, recognition, as well as the correct management of individual complications.

Complications of the stoma complex

Of the various classifications, the one proposed by the WOCN Society[4], only considers a few of all possible complications, however, such classification allows us to distinguish the area of interest of the individual complication, emphasizing that: stoma complications concern true alterations of the intestinal tract/ extroverted urinary everted which can occur either in the early or late postoperative period; conversely, peristomal complications, concern everything that affects the skin around the stoma, as well as the skin present below the hydrocolloid adhesive, below the skin barrier adhesive, and others the edge of the skin barrier itself (Table 1).

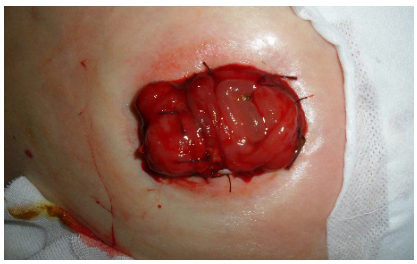
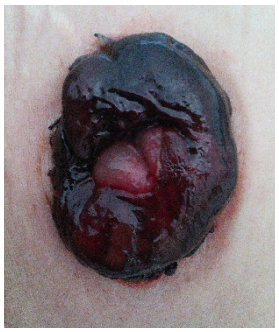
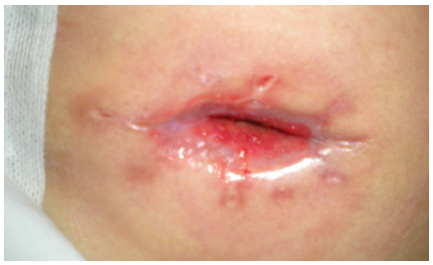
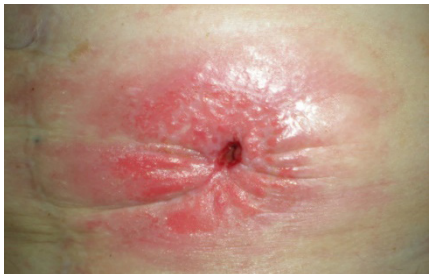
Part I: Stoma complications

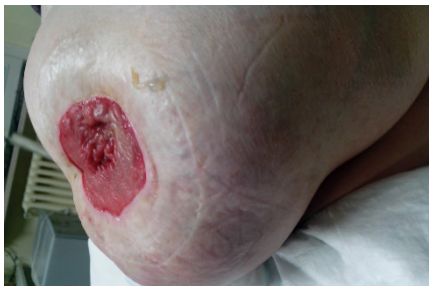
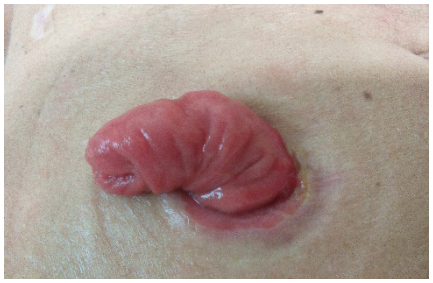
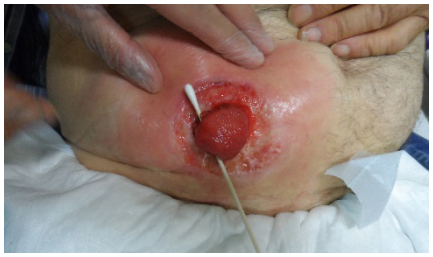
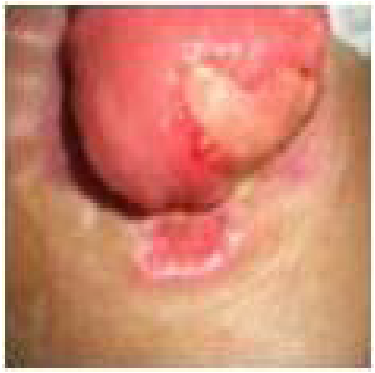
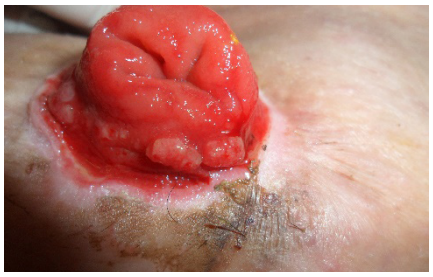
Table 1: Stoma and Peristomal Complications

STOMA COMPLICATIONS	PERISTOMAL COMPLICATIONS	
Stoma Edema	**Lesions characterized by loss of substance**	• Irritative Contact Dermatitis/ PMASD • Muco-cutaneous Detachment • Allergic Contact Dermatitis • Trauma Injuries • Peristomal Ulcers • Peristomal Pyoderma Gangrenosum • Artifact Dermatitis
Malpositioning		
Malpacking		
Bleeding/ Haemorrhage		
Ischemia and Necrosis	**Proliferative Lesions**	• Pseudo-verrucous Lesions - Extraneous body or Stitch Granulomas - Aspecific Fibrin-producing Nodules - Inflammatory Pseudopolypses - Hypergranulation Tissue • Oxalate Deposits • Neoplasias
Retraction		
Stenosis		
Prolapse		
Hernia		
Fistula	**Peristomal Sin Infection**	• Candidosis • Folliculitis • Pseudomonas Aeruginosa
Trauma		
Infiammatory Pseudopolypses	**Pre-existing Skin Disorders**	• Psoriasis • Eczema • Seborrheic Dermatitis
STOMA AND PERISTOMAL ATYPIA		
• Peristomal Varices • Clostridium Difficile • Melanosis		

Stoma complications are among the most investigated outcomes in the literature and are uniquely defined by professionals. Among them we include bleeding/hemorrhage, stenosis, retraction, prolapse, ischemia and necrosis, hernia, fistula, trauma, and inflammatory pseudopolypses (Table2). However, other misrecognized and underestimated complications, whose incidence is unknown, should also be mentioned. These complications include edema of the stoma, defined as both early and late complication and, malpositioning and malpacking[39]. These latter ones are closely related to surgery practice and can be effectively prevented by performing an adequate preoperative design and which turn out to be responsible for further stoma and peristomal complications.

Table 2: Stoma Complications

Complications	Incidence (%)	Description
Bleeding/ Hemorrhage 	7.4-14% [10,11,12]	Can be defined as either early or late complications. Blood loss can occur either from the peristomal suture, peristomal bleeding, or from the viscera itself, intra-stomal bleeding. Its occurrence may depend on surgical factors, comorbidities of the subject, or intrinsic factors of the stomal complex.
Ischemia and Necrosis 	0.37-20%[11,13,14]	Most frequently occurs as an early complication related to insufficient arterial supply at the stomal site related to: excessive traction of vessels intraoperatively, mesenteric hematoma, excessive ligation of vessels, making the abdominal wall hole too narrow, excessive use of inotropic substances in the postoperative period. It can be partial, if limited in the first 3-5cm of the emerging portion of the viscera, or total in case it affects the entire intestinal loop. Ischemia and subsequent necrosis of the stoma, however, can also occur late following total prolapse of the ostomy.
Retraction 	3.2-32.2%[12,14,19]	It represents one of the most frequent late complications. It can be defined by the presence of one or more conditions among: the levelling of the stoma below the skin plane; the underlying viscera applies inward tension on the stoma such that it carries the surrounding skin with it. Its occurrence may be related to failure/inadequate eversion of the intestinal loop, malpositioning of the ostomy, excessive mesenteric tension in relation to its length and size, high BMI, or it may occur as a result of healing processes of a previously peristomal complication.
Stenosis 	0.7-15% [6,9,13,15,20-24]	Late complication defined by reduction of the stomal lumen at the peristomal skin or muscular fascia, such that normal effluent leakage is not ensured. It can occur as a result of: inadequate skin and/or fascial incision; preoperative radiotherapy; as an outcome of repeated microtrauma by the ostomy pouching system, suppurative processes or stomal retraction. It is easily associated with the reactivation of systemic inflammatory processes, such as Crohn's Disease.

Hernia 	2.3-78% [9,25-36]	Late complication defined by dislocation of the stomal loop due to failure of the abdominal wall, which occurs as a result of complete or partial detachment of the aponeurotic fascia. If this collects in the subcutis surrounding the ostomy itself, it will be called a peristomal hernia; if the fascia occupies the space lateral to the ostomy, it will be called a parastomal hernia. Among the risk factors contributing to the occurrence of this we have: aging and consequent weakness of abdominal muscles, BMI>25 and high abdominal circumference, BPCO, diabetes mellitus, constipation, intense exertion.
Prolapse 	2-75% [37]	Late complication defined as excessive protrusion of the stomal loop beyond the abdominal skin plane. It can be partial, mucosal prolapse if there is exclusively the sliding of the mucosal tonaca over the muscular tonaca for a maximum of 3-4cm; or total in case there is evagination of the entire loop. Prolapse may be fixed, if the loop is constantly prolapsed, or intermittent if it occurs during the Valsalva Maneuver or as a result of increased intra-abdominal pressure. Generally, prolapse is related to excessive parietal and cutaneous incision width and/or a viscero-parietal fixation defect.
Fistula 	2.3-5.1%[9,12,14,38]	Clinically defined as the formation of a neo-pathway that connects two cavities or one cavity with the outside. For the stoma complex, we distinguish: viscero-cutaneous fistula, involves the opening of a communication conduit between the lumen of the stomal loop and the abdominal skin; trans-luminal fistula, connects the visceral lumen with the outside, crossing the totality to involve the everted mucosa above the skin plane. The causes by which these occur are many: repeated trans-stomal trauma; outcomes of parastomal abscesses, deep seromuscular sutures, or suppuration of sutures. They occur mainly in individuals with Crohn's disease.
Trauma 		Injuries caused by traumatic events on the stoma. Stomal trauma may be internal, with perforation of the intestinal loop, which in turn may be intraperitoneal, extraperitoneal, or intramesenteric; or external trauma concerning the tract of viscera protruding from the skin plane. These can result in edema, hemorrhage, and even result in peritonitis due to perforation of the intestinal loop and leakage of fecal material into the abdomen. The main causes that can lead to the establishment of trauma include: perforations due to improper colic irrigation practice; violent stoma-care maneuvers; the application of ostomy belts that are too tight; small plaque orifice diameter.
Inflammatory Pseudopolypes 		These are hyperplastic, fibrino-proliferative formations with a benign character, localized at the level of the mucosa of the ostomy. In the SACS Classification 2.0 they fall under Proliferative Lesions (LX) that can affect both the peristomal skin and the mucosa of the stoma itself[57].

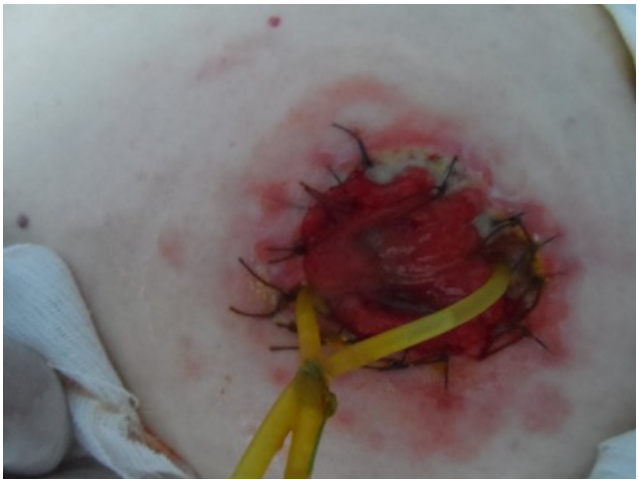
1.1 Malpositioning

Malpositioning is a condition in which the stoma is packed in a location, in a way that proper management of effluent collection is difficult or even impossible[40].

This represents one of the most frequent complications of the ostomy complex, which is associated with missed or incorrect preoperative evaluation, packing of the ostomy at the laparotomy wound site or the laparoscope trocar access point, or the packing of the device near osseous protrusions or skin folds.

The presence of a misplaced ostomy affects not only the achievement of the stoma patient autonomy and the realization of its safe appliance but is also responsible for a higher incidence of peristomal skin complications, retractions, and stenosis of the stoma itself (Figure 1).

Figure 1: Malpacking - loop colostomy on rod, packed equal with abdominal skin plane.



1.2 Malpacking

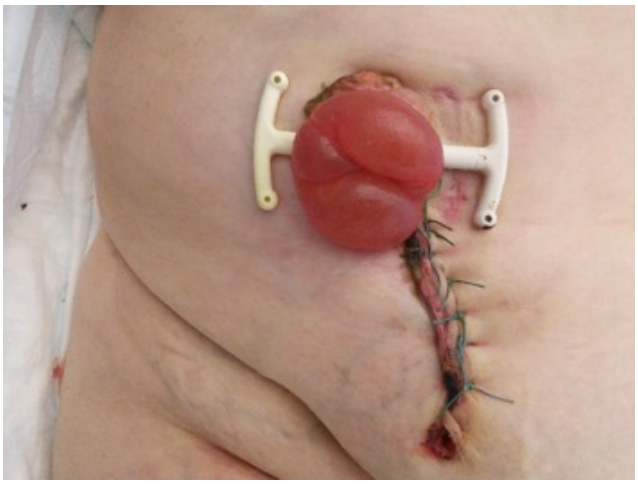
Malpacking represents the inadequate execution of surgical technique during the act of ostomy packing, and it is most commonly encountered in cases of loop ostomies on a rod and intimately related to a lack of surgical expertise[40]. Secondary complications related to malpacking include (i) delay in proper intestinal canalization and difficulty in feeding, (ii) increased risk of obstruction and infection due to proliferation of intestinal bacterial flora, (iii) increased risk of dehiscence of the colo-rectal anastomosis, (iv) alterations in the peristomal skin, and (v) worsening of the patient quality of life (Figure 2).

1.3 Stoma edema

Stoma edema occurs due to obstruction of venous flow resulting in an increase in the interstitial water component of the stoma. Edema is the most common complication occurring in the early postoperative period, which generally resolves spontaneously within 6-8 weeks; this represents the main reason for not being considered a true ostomy complication (Figure 2).

However, in rare cases, edema can result in momentary stenosis and paracellular necrosis of the stoma mucosa, especially if the underlying cause persists over time. The final stage can be the onset of mucocutaneous detachment. The most common causes of edema are excessive traction and/or manipulation of the bowel loops, insufficient diameter of the opening on the abdominal wall, fluid stagnation, and plaque opening of a smaller diameter than the stoma itself. When stomal edema occurs in the postoperative period, the presence of other pathological condition should be considered, such as the presence of masses compressing blood vessels, hernia, or ostomy prolapse.

Figure 2: Stoma Edema and Malpositioning - loop ileostomy on rod packing in right iliac fossa, at right iliac crest, on surgical wound. Stoma on postoperative day 5 appears visibly edematous.



Part II: peristomal complications

Peristomal skin disorders are a major problem affecting about 1/3 of ostomized patients, and more than 2/3 of patients with ileostomies and urostomies[41]. The incidence of these has been estimated between 52-56%[42,43].

The main cause of these complications is certainly the contact of the skin with the elimination agents from the ostomy[44], but the peristomal complications that can occur are various and of different nature; in fact, we distinguish lesions characterized by loss of substance, proliferative lesions, infections, and pre-existing skin disorders[45].

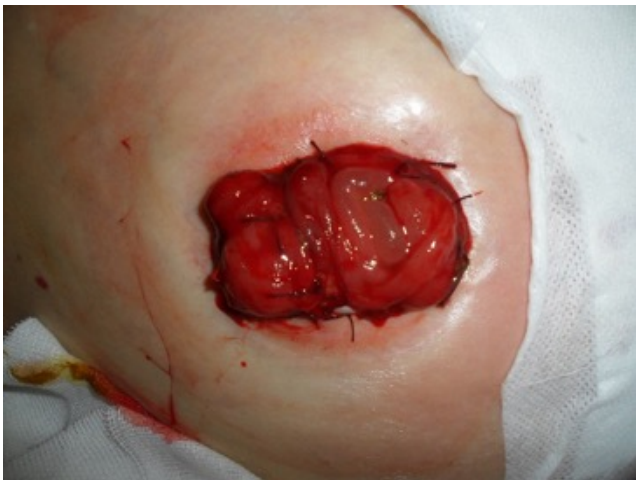
2.1 Lesions characterized by loss of substance

They may develop in the immediate or late postoperative period and are associated with surgical defects, intra-operative contamination, a history of chronic diseases, and errors in the equipment of the pouch system. Lesions characterized by loss of substance include (i) irritative contact dermatitis, (ii) mucocutaneous detachment, (iii) allergic contact dermatitis, (iv) peristomal pyoderma gangrenosum, (v) trauma injury, (vi) peristomal ulcer, (vii) artifact dermatitis.

Irritative contact dermatitis

The most common lesion of this type is irritative contact dermatitis, also called peristomal moisture-associated dermatitis in the Anglo-Saxon literature[46,47]. Having an approximate incidence of 30-40%, irritative contact dermatitis is defined as skin damage caused by prolonged contact between the abdominal skin and feces, urine, or gastric juice, which remain confined to the area of exposure; the lesion is erythematous-edematous with superficial areas of erosion. Erythema of the peristomal skin may evolve into an erosive lesion, which eventually evolves into a true ulcerative lesion if the defect is not corrected promptly. Such lesions are also accompanied by itching and are often associated with a bacterial infection. Irritative contact dermatitis may be related to various causes such as malpositioning or malpacking of the ostomy such that the correct application of the pouch system is not ensured, high-flow ostomies, the use of disinfectants or devices inappropriate for ostomy management, as well as improper positioning of the ostomy system, usually in terms of excessive diameter of the adhesive plaque (Figure 3).

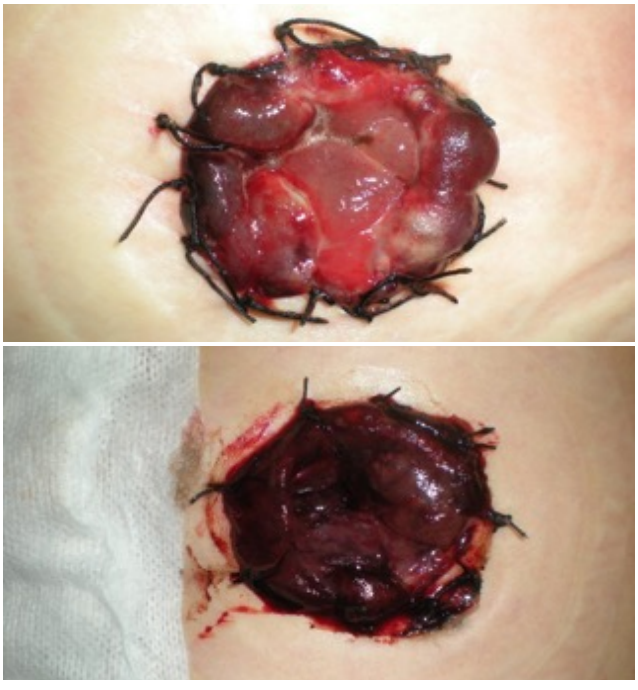
Figure 3: Bleeding - Intrastomal and Peristomal bleeding in lateral ileostom.



Mucocutaneous detachment

Next in high incidence among lesions characterized by loss of substance is mucocutaneous detachment or mucocutaneous dehiscence. Their incidence ranges from 15% to 32%, with differences in classification according to early and late complications[11,14,38,48]. It is defined as a separation of the peristomal skin from the intestinal loop that constitutes the stoma. This is a complication occurring within the first weeks of the postoperative period and can be partial, if it involves only part of the peristomal suture, or total if it involves the entire circumference of the stoma. It can be superficial, if it involves only the epidermis, or deep if it also involves the dermis and subcutis. If the detachment goes as far as to involve the muscle fascia, it may induce peritonitis, given the passage of effluent into the abdominal cavity. The presence of detachment can compromise the leakage of the ostomy collection system, therefore favoring the onset of peristomal skin complications. Moreover, healing of mucocutaneous detachment tends to favor scar formation that very often leads to further complications, mainly stenosis and retraction[49]. The occurrence of mucocutaneous detachment is related to several factors, including excessive mucocutaneous suture tension, necrosis of the stoma, diabetes, corticosteroid drugs, malnutrition, immunosuppression due to chemo- or radiotherapy, and chronic inflammatory bowel disease (Figure 4).

Figure 4: Ischemia and Necrosis - Process of ischemia and subsequent necrosis in terminal Sigmoidostomy, occurring during the first postoperative week.



Allergic contact dermatitis

Allergic contact dermatitis is characterized by skin inflammation related to sensitization against one or more components of the products used for stoma care; this allergic reaction may occur even after several times after the use of the products. The lesion is erythematous-vesicular in type, papular or bullous with undefined margins, and may be accompanied by itching and pain; over time the skin will undergo desquamation and formation of scabs and excoriations. The characteristic of these lesions is that they remain confined to the area of contact and tend to resolve spontaneously when exposure to the allergen is discontinued. In order to make a definite diagnosis of allergic contact dermatitis, the patient needs to have a Patch-test and Prick-test performed in specialized dermatology departments. Precisely because the certain diagnosis of these is medically based, so it is difficult to have certain data, the international literature does not report data on the incidence of this complication; moreover, in a recent Consensus taking place in 2018, allergic dermatitis was included under peristomal complications defined as PMARSI (peristomal medical adhesive-related skin injuries)[50], and this results in an aggregation of data that does not allow a definition its exact incidence.

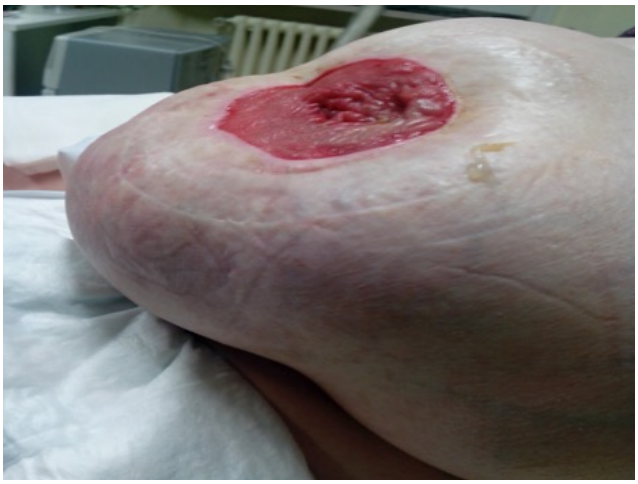
Trauma injuries

Also belonging to PMARSIs are trauma injuries, described as an alteration of skin integrity characterized by erythema and other lesions such as skin tears, erosion, blisters, or vesicles, caused by traumatic events on the peristomal skin, such as adhesives to keep the garment in place for a longer time. The resulting injury may have an erosive character until it evolves into a true ulceration[51].

Peristomal ulcer

Decubitus Injury or pressure ulcer is defined as a "localized injury to the skin and/or underlying tissue, usually located on a bone prominence, as a direct result of high or prolonged compression, or shear or stretching forces, resulting in mechanical stress to the tissues and constriction of blood vessels."[52]. In this specific case, decubitus injuries affecting the peristomal skin mostly develop due to friction or pressure injuries related to the pouch system and the type of accessory used (convex plaques, ostomy belts, rigid ostomy rods), which, induce ischemia and necrosis of the underlying tissues as a result of a force applied to the skin. This factor, in addition to excess moisture, causes the rupture of the stratum corneum of the epidermis, maceration, and finally ulceration. Peristomal ulcers may be superficial, (i.e., partial-thickness of the skin), or deep (i.e., full-thickness of the skin), and should be examined carefully for signs of infection. This complication does not fall into the group of PMARSI, although it is associated with medical equipment (Figure 5).

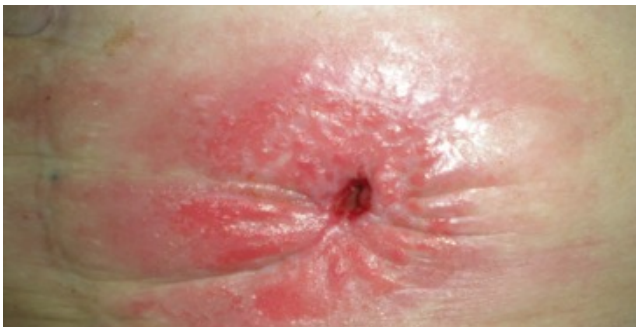
Figure 5: Retraction, Prolapse, Hernia - A patient with a left terminal colostomy showing a complex picture characterized by: voluminous parastomal hernia, which over time has promoted the onset of mucosal prolapse and stoma retraction.



Peristomal pyoderma gangrenosum

Peristomal Pyoderma Gangrenosum is clinically defined as a non-infectious neutrophilic dermatosis that originates with the appearance of sterile pustules, progresses rapidly, and evolves into painful ulcerations of variable depth and diameter, the edge of which is irregular and characterized by a violaceous or blue discoloration (Figure 6). This complication is often associated with the presence of recurrent skin ulcerations with mucopurulent or hemorrhagic exudate. It generally occurs in patients with chronic inflammatory intestinal diseases, chronic rheumatologic diseases, and hematologic malignancies. Because the etiology has not been determined, the diagnosis is based on careful proximal and remote pathologic history, in addition to the objective examination, as well as observation of the lesion, the outcome of the histopathologic examination, and the exclusion of other diseases that may present a similar clinical pattern. Data in the literature show that this complication has an incidence ranging from 0.3% to 8%[3,53,55].

Figure 6: Stenosis -Terminal Sigmoidostomy; the complication in question arises as a result of a process of ischemia and necrosis that, has caused first detachment of the mucocutaneous junction and subsequent retraction of the stoma, and finally, as an outcome of the healing process, stenosis of the same.



Artifact dermatitis

Artifact Dermatitis is defined by the presence of a self-induced traumatic lesion presenting an atypical distribution and shape, and a chronic course over time. It is an infrequent very delicate condition at the same time for which the patient requires psychiatric consultation.

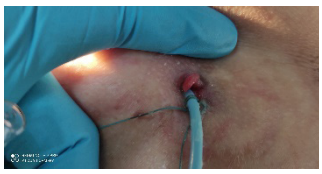
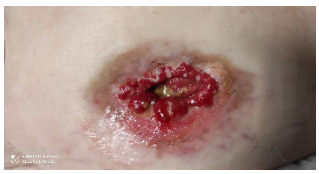
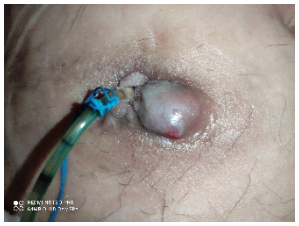
2.2 Proliferative lesions

Over the years, various peristomal skin scales have been proposed to classify proliferative lesions as complications of peristomal skin. The earliest one, proposed in the late 1980s, Classification of Peristomal Skin (CPS), specific for skin changes related to uretero-ileocutaneostomies, exclusively refers to pseudo-verrucous lesions[56]. The Ostomy Skin Tool (OST), among the variables examined, defines the T parameter as tissue accretion/hyperplasia[57]. The Scale for Peristomal Skin Disorders Classification (SACS) classification system proposed in 2006[58], and the subsequent revision that led to the introduction of the SACS Scale 2.0 in 2016[59], define LX proliferative lesions, the appearance of abnormal outgrowths such as hyperplasia, granulomas, oxalate deposits, and neoplasms. Finally, among the most recent classification tools, the Peristomal Lesion Scale (PLS), proposed in 2017 by the National AIOSS Association, identifies in variable A, accretionary skin alteration, all proliferative lesions without distinction[60].

Beyond the citations on this type of complication, there are no significant publications in the international literature regarding both incidence and etiopathogenesis. This group of lesions appears to include the following:

- Pseudo-verrucous lesions: also referred to by the terms chronic papillomatous dermatitis and/or pseudoepitheliomatous hyperplasia, are hyperplasias of the epidermis characterized by the excessive growth of tissue caused by exposure of the skin to an irritant agent, such that they generate first hyperkeratosis and later, acanthosis. These are fibrin-productive formations of a benign nature, which can appear either on the peristomal skin or the mucosa of the ostomy. Hyperkeratotic lesions can cause stenosis of the ostomy, to the point that they require a surgical intervention. Among pseudo-verrucous lesions, several forms are distinguished, which are described in Table.3.
- Oxalate deposits: defined by the presence of white crystals on the peristomal skin and stoma; formation of these crystals is facilitated by the excretion of alkaline, concentrated urine or the presence of urinary tract infection.
- Neoplasias: true neoplastic masses that form at the base of the stoma or in the peristomal region, after inadequate resections of the primary cancer or following recurrence of the disease, or still be the outcome of non-malignant disease such as a chronic peristomal inflammatory process. Such lesions are characterized by uncontrolled development, ease of bleeding, and absence of pain; in some cases, they may present with the appearance of ulcers with a turbid background that does not regress with usual treatment. The diagnosis of neoplasia is always conducted using biopsy sampling of the lesions.

Table 3: Peristomal complications – Pseudo-verrucous lesions

Extraneous body or stitch granulomas	**Aspecific fibrin-producing nodules**	**Inflammatory pseudopolypes**	**Exuberant granulation or hypergranulation tissue**
			
They mainly form on the muco-cutaneous junction as a consequence of a chronic inflammatory reaction and, are characterized by nodular neoformations with concentric microscopic structure that are easily bleeding and painful.	Found most frequently at the level of the hemi-circonference of the muco-cutaneous junction, they occur as a result of chronic tissue irritation from continuous contact of effluent with peristomal skin.	Can be classified as either stomal or peristomal complications. These are fibrino-proliferative formations that occur as a result of trauma to the stomal mucosa most commonly.	Represents an outgrowth of red, friable, shiny, easily bleeding tissue that extends beyond the margins of the lesion, above the surrounding skin tissue.

2.3 Peristomal skin infections

- Candidosis: defined by the presence of lush vegetation of microorganisms belonging to the Candida family, in sufficient quantity to cause inflammation, infection, and disease of the skin on the peristomal area. Excessive overgrowth of it is typically promoted by a humid setting, typical of that between the pouch system and the peristomal skin, heat, antibiotic, and chemotherapeutic treatments. Such conditions promote the occurrence of itchy erythematous lesions with irregular borders associated with satellite pustulosis.
- Folliculitis: linked to Staphylococcus Aureus infection of one or more follicles causing inflammation and the development of erythematous-pustular lesions. It occurs following frequent shaving and/or changing of pouch systems, and risk factors for the onset of these include diabetes mellitus, malnutrition, immunodeficiency, chronic Staphylococcal infections, and obesity.
- Pseudomonas aeruginosa: Organism present in the bowel that, under special conditions, can colonize and infect wounds and ulcers, most frequently in diabetic subjects or those with a poor general clinical condition. Lesions caused by this appear erythematous-edematous in character accompanied by the presence of pustules at the edges of the lesion.

2.4 Pre-existing skin disorders

- Psoriasis: a hyperproliferative skin disease, benign in nature, characterized by well-defined, silvery-white erythematous-squamous plaques. The patient with this pathology will present under and around the pouch system, what is called "Koebner's phenomenon" or Koebner's reactive isomorphism, as well as the occurrence of new lesions typical of the disease on previously healthy skin areas subjected to mechanical trauma of various kinds, such as what may be represented by frequent replacement of the pouch system.
- Eczema: linked to an underlying inflammatory process that probably arises from contact with a specific agent, it presents as dermatitis characterized by profuse exudate and blister formation, accompanied by itching and redness, which may desquamate or form scabs on their surface. Sometimes, if these become chronic, they tend to form true rhagades.
- Seborrheic dermatitis: an eczematous process that follows a characteristic pattern of body distribution; in fact, the impacted areas are the scalp, face, chest, and skin folds, the etiology of which is unknown and probably immunologically based. The resulting lesion is characterized by a typical erythematous rash, accompanied by yellowish, greasy squamas.

Part III: Stoma and peristomal atypies

Discussion of some rare stoma and peristomal complications is necessary for this review since the international literature has reported scarce information. These have been referred to as

"atypical" because they cannot be classified, but their knowledge is necessary to prevent the occurrence of further complications or, distinguish them from other complications listed above that may have a similar presentation. These include:

- Melanosis: a condition in which the intestine appears black/brownish in discoloration related to the retention of protein and lipid substances within the macrophages that populate the walls of the intestinal tract, as a result of excessive use of anthraquinone-type laxatives. It turns out to be important, if not essential, to be able to differentiate this from stoma ischemia/necrosis (Figure 7).
- Clostridium difficile: anaerobic, Gram-positive bacterium, physiologically present in the intestinal and vaginal bacterial flora, whose colonization and proliferation are promoted by exposure of the bacterial flora to antibiotics. At the intestinal level, this causes what is called "pseudomembranous colitis," which manifests with raised yellowish-white plaques on the colic mucosa while the mucosal areas interposed between the plaques appear relatively normal. Clinical patterns can be quite heterogeneous starting from completely asymptomatic forms, intermediate forms with fever, diarrhea, and abdominal pain, to extremely severe forms of colitis such as those known under the term "Clostridium difficile fulminant colitis".
- Peristomal varices: lesions forming when the cutaneous portosystemic collateral circles are activated, eventually leading to the formation of a peristomal vascular plexus which over time forms a caput medusae. Peristomal varices are rare complications, but their bleeding can be significant and difficult to manage (Figure 8).

Figure 7: Fistula - Terminal ileostomy characterized by the presence of trans-stomal fistula.

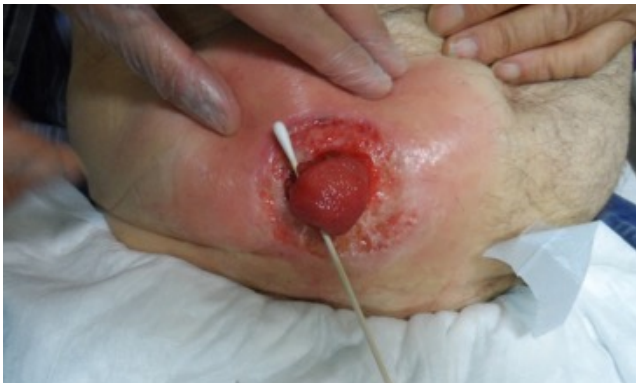
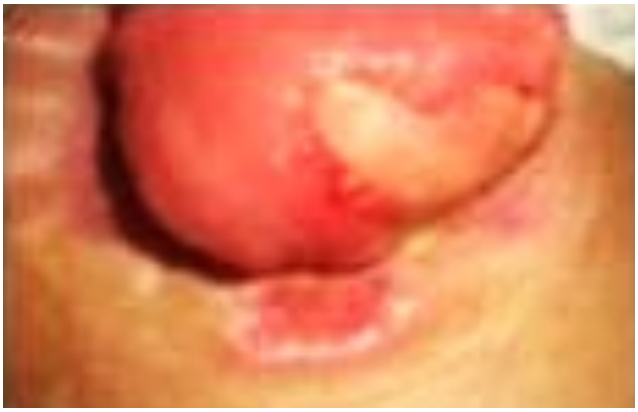


Figure 8: Trauma - External stoma trauma determined by excessively small diameter of the pouch system plaque, such that it results in ulceration of the stoma mucosa.



Conclusion

Complications of the ostomy complex represent a limitation in the lifestyle re-adaptation process of the ostomy patient. Knowing how to define, recognize and subsequently treat individual complications, requires a multidisciplinary and interdisciplinary approach where knowledge in the fields of medical-surgical, wound care, and stomatherapy meet in order to place the ostomy patient at the center of an integrated system, to guide him or her along a process of autonomy and physical, psychological and social wellness.

Thereby, making the definitions of the various complications standardized turns out to be necessary to bring further progress in the field of nursing research in this area, as well as to facilitate the management of "difficult ostomies".

References

1. Krouse RS, Herrinton LJ, Grant M, Wendel CS, Green SB, Mohler MJ, Baldwin CM, McMullen CK, Rawl SM, Matayoshi E, Coons SJ, Hornbrook MC. Health-related quality of life among long-term rectal cancer survivors with an ostomy: manifestations by sex. J Clin Oncol. 2009 Oct 1;27(28):4664-70. doi: 10.1200/JCO.2008.20.9502. Epub 2009 Aug 31. PMID: 19720920; PMCID: PMC2754912ù
2. Jayarajah, U., Samarasekara, A.M.P. & Samarasekera, D.N. A study of long-term complications associated with enteral ostomy and their contributory factors. BMC. 2016; Res Notes 9, 500. https://doi.org/10.1186/s13104-016-2304-z
3. Shabbir J, Britton DC. Stoma complications: a literature overview. Colorectal Dis. 2010 Oct;12(10):958-64. doi: 10.1111/j.1463-1318.2009.02006.x. PMID: 19604288.
4. Wound, Ostomy and Continence Nurses Society (WOCN) (2005). Stoma complications: best practice for clinicians. Mount Laurel, NJ: Author. Retrieved from www.wocn.org; Wound, Ostomy and Continence Nurses Society (WOCN) (2007). Stoma complications: best practice for clinicians. Mount Laurel, NJ: Author. Retrieved from www.wocn.org,
5. Steinhagen E, Colwell J, Cannon LM. Intestinal Stoma-Postoperative Stoma Care and Peristomal Skin Complications. Clin Colon Rectal Surg 2017; 30:184-192.
6. Krishnamurty DM, Blatnik J, Mutch M. Stoma Complication. Clin Colon Rectal Surg 2017; 30:193-200.
7. Dellafiore F., Caruso R., Villa G. et al. Quali sono i fattori di rischio e la prevalenza delle complicanze stomali? Risultati di una revisione sistematica della letteratura e meta-analisi in "Memorial Gian Carlo Canese". Atti del 3° Congresso Nazionale AIOSS "Stomaterapia e dintorni professionali", a cura di C. Saracco, AIOSS, Montesilvano: Ottobre 2021. 4-38. https://aioss.it/wp-content/uploads/2021/10/memorial-canese-1a-edizione.pdf
8. Salvadalena GD. The incidence of stoma and peristomal complications during the first 3 months after ostomy creation. J Wound Ostomy Continence Nurs. 2013 Jul-Aug;40(4):400-6.
9. Malik TAM, Lee MJ, Harikrishnam AB. The incidence of stoma related morbility – a systematic review of randomised controlled trials. Ann R Coll Surg Engl 2018; 100:501-508. doi: 10.1308/rcsann.2018.0126
10. Ahmad Z, Sharma A, Saxena P, Choudhary A, Ahmed M. A clinical study of intestinal stomas: its indications and complications. Int J Res Med Sci. 2013 Nov;1(4):536-540 www.msjonline.org DOI: 10.5455/2320-6012.ijrms20131140
11. Formijne Jonkers HA, Draaisma WA, Roskott AM, van Overbeeke AJ, Broeders IA, Consten EC. Early complications after stoma formation: a prospective cohort study in 100 patients with 1-year follow-up. Int J Colorectal Dis. 2012 Aug;27(8):1095-9. doi: 10.1007/s00384-012-1413-y. Epub 2012 Jan 31. PMID: 22302593.
12. P Nastro, C H Knowles, A McGrath, B Heyman, T R C Porrett, P J Lunniss, Complications of intestinal stomas, British Journal of Surgery, Volume 97, Issue 12, December 2010, Pages 1885–1889, https://doi.org/10.1002/bjs.7259
13. Bafford AC., Irani JL. Management and complications of stomas. Surg Clin North Am. 2013; 93(1):145-66.
14. Parmar KL., Zammit M., Smith A., Kenyon D., Lees NP. Greater Manchester and Cheshire Colorectal Cancer Network. A prospective audit of early stoma complications in colorectal cancer treatment throughout the Greater Manchester and Cheshire colorectal cancer network. Colorectal Dis. 2011; 13(8):935-38.
15. Sung, Young Hee; Kwon, Ingak; Jo, Sungho; Park, Seungmi. Factors Affecting Ostomy-Related Complications in Korea. Journal of Wound, Ostomy and Continence Nursing 37(2):p 166-172, March 2010. | DOI: 10.1097/WON.0b013e3181cf7b76
16. Harilingam M, Sebastian J, Twum-Barima C, Boshnaq M, Mangam S, Khushal A, Marzouk D, Tsavellas G. Patient-related factors influence the risk of developing intestinal stoma complications in early post-operative period. ANZ J Surg. 2017 Oct;87(10):E116-E120. doi: 10.1111/ans.13397. Epub 2015 Dec 3. PMID: 26631370.
17. Koc U, Karaman K, Gomceli I, Dalgic T, Ozer I, Ulas M, Ercan M, Bostanci E, Akoglu M. A Retrospective Analysis of Factors Affecting Early Stoma Complications. Ostomy Wound Manage. 2017 Jan;63(1):28-32. PMID: 28112647.
18. Miyo, M., Takemasa, I., Ikeda, M. et al. The influence of specific technical maneuvers utilized in the creation of diverting loop-ileostomies on stoma-related morbidity. Surg Today 47, 940–950 (2017). https://doi.org/10.1007/s00595-017-1481-2
19. Szymanski KM, St-Cyr D, Alam T, Kassouf W. External stoma and peristomal complications following radical cystectomy and ileal conduit diversion: a systematic review. Ostomy Wound Manage. 2010 Jan 1;56(1):28-35. PMID: 20093715.
20. Landmann RG, Cashman AL. Ileostomy or Colostomy care and complications. UpTODate: Nov 16, 2021. https://www.medilib.ir/uptodate/show/1384
21. Murken DR, Bleier JIS. Ostomy-Related Complications. Clin Colon Rectal Surg. 2019 May;32(3):176-182. doi: 10.1055/s-0038-1676995. Epub 2019 Apr 2. PMID: 31061647; PMCID: PMC6494607.
22. Aboulian A. Ostomy Complications in Crohn's Disease. Clin Colon Rectal Surg. 2019 Jul;32(4):314-322. doi: 10.1055/s-0039-1683924. Epub 2019 Jun 17. PMID: 31275079; PMCID: PMC6606323.

23. Schiergens TS, Hoffmann V, Schobel TN, Englert GH, Kreis ME, Thasler WE, Werner J, Kasparek MS. Long-term Quality of Life of Patients With Permanent End Ileostomy: Results of a Nationwide Cross-Sectional Survey. Dis Colon Rectum. 2017 Jan;60(1):51-60. doi: 10.1097/DCR.0000000000000732. PMID: 27926557.
24. Lindholm E, Persson E, Carlsson E, Hallén AM, Fingren J, Berndtsson I. Ostomy-related complications after emergent abdominal surgery: a 2-year follow-up study. J Wound Ostomy Continence Nurs. 2013 Nov-Dec;40(6):603-10. doi: 10.1097/WON.0b013e3182a9a7d9. PMID: 24108321.
25. Antoniou SA, Agresta T, Garcia Alamino JM, et al. European Hernia Society giudelines on prevention and treatment of parastomal hernias. Hernia 2018; 22:183-98.
26. Tsujinaka S, Tan KY, Miyakura Y, Fukano R, Oshima M, Konishi F, Rikiyama T. Current Management of Intestinal Stomas and Their Complications. J Anus Rectum Colon. 2020 Jan 30;4(1):25-33. doi: 10.23922/jarc.2019-032. PMID: 32002473; PMCID: PMC6989127.
27. Park, Jemin M.D.; Rivard, Samantha J. M.D.; Maguire, Lillias M.D.; Varlamos, Christopher B.S.; Duby, Ashley M.S.; Hendren, Samantha M.D., M.P.H.. Parastomal Hernia Rates and Exercise Following Ostomy Surgery. Diseases of the Colon & Rectum ():, January 31, 2022. | DOI: 10.1097/DCR.0000000000002395
28. Liu L, Zheng L, Zhang M, Hu J, Lu Y, Wang D. Incidence and risk factors for parastomal hernia with a permanent colostomy. J Surg Oncol. 2022 Sep;126(3):535-543. doi: 10.1002/jso.26919. Epub 2022 May 24. PMID: 35608292.
29. Shiraishi T, Nishizawa Y, Ikeda K, Tsukada Y, Sasaki T, Ito M. Risk factors for parastomal hernia of loop stoma and relationships with other stoma complications in laparoscopic surgery era. BMC Surg. 2020 Jun 22;20(1):141. doi: 10.1186/s12893-020-00802-y. PMID: 32571293; PMCID: PMC7310075.
30. Pilgrim, Charles H. C. M.B.B.S. (Hons.), F.R.A.C.S.1,2; McIntyre, Richard M.B.B.S., F.R.A.C.S.2; Bailey, Michael Ph.D., M.Sc. (Statistics), B.Sc. (Hons.)1,3. Prospective Audit of Parastomal Hernia: Prevalence and Associated Comorbidities. Diseases of the Colon & Rectum 53(1):p 71-76, January 2010. | DOI: 10.1007/DCR.0b013e3181bdee8c
31. Aquina CT, Iannuzzi JC, Probst CP, Kelly KN, Noyes K, Fleming FJ, Monson JR. Parastomal hernia: a growing problem with new solutions. Dig Surg. 2014;31(4-5):366-76. doi: 10.1159/000369279. Epub 2014 Dec 13. PMID: 25531238.
32. Mehboob A, Perveen S, Iqbal M, Moula Bux K, Waheed A. Frequency and Complications of Ileostomy. Cureus. 2020 Oct 29;12(10):e11249. doi: 10.7759/cureus.11249. PMID: 33274131; PMCID: PMC7707129.
33. Harraz AM, Elkarta A, Zahran MH, Elsawy AA, Elbaset MA, Elsorougy A, Osman Y, Mosbah A, Abol-Enein H, Shaaban AA. Parastomal hernia after ileal conduit urinary diversion: re-visiting the predictors radiologically and according to patient-reported outcome measures. Scand J Urol. 2020 Dec;54(6):501-507. doi: 10.1080/21681805.2020.1832144. Epub 2020 Oct 16. PMID: 33063578.
34. Correa Marinez A, Bock D, Erestam S, Engström A, Kälebo P, Nielsen YW, Rosenberg J, Haglind E, Angenete E. Methods of Colostomy Construction: No Effect on Parastomal Hernia Rate: Results from Stoma-const-A Randomized Controlled Trial. Ann Surg. 2021 Apr 1;273(4):640-647. doi: 10.1097/SLA.0000000000003843. PMID: 32209907.
35. Li Z, Zhang Z, Ma H, Yao K, Qin Z, Han H, Ye Y, Li Y, Dong P, Jiang L, Tian L, Liu Z, Zhou F. Extraperitonealization of ileal conduit reduces parastomal hernia after cystectomy and ileal conduit diversion. Urol Oncol. 2022 Apr;40(4):162.e17-162.e23. doi: 10.1016/j.urolonc.2021.11.022. Epub 2021 Dec 15. PMID: 34920945.
36. Xie HF, Feng M, Cao SM, Jia YY, Gao P, Wang SH. Evidence summary for nonsurgical prevention and management of parastomal hernia in patients with enterostomy. Am J Transl Res. 2021 Nov 15;13(11):13173-13182. PMID: 34956538; PMCID: PMC8661159.
37. Ambe PC, Kurz NR, Nitschke C, Odeh SF, Möslein G, Zirngibl H. Intestinal ostomy- classification, indications, ostomy care and complication management. Dtsch Arztebl Int. 2018; 115:182-7.
38. Kalashnikova I., Achkasov S., Fadeeva S., Vorobiev G. The development and use of algorithms for diagnosing and choosing treatment of ostomy complications: results of a prospective evaluation. Ostomy Wound Management. 2011; 57(1):20-7.
39. Antonini M, Barbierato M. Le complicanze del complesso stomale: valutazione e care infermieristico. In: A.I.O.S.S. Arte e scienza dell'assistenza infermieristica in stomaterapia: curare, prendersi cura, educare, a cura di Carla Saracco. Castellato (TE): Editpress S.r.l.; luglio 2021; 492-540
40. Barbierato M, Bergamini M, Cimmino M et al. Eziopatologia e Management Care delle Complicanze In: A.I.O.S.S. Atlante stomie e complicanze: epidemiologia, eziopatologia, management care, a cura di Rastelli G. e Saracco C. Castellato (TE): Editpress S.r.l; settembre 2011
41. Herlufsen P, Olsen AG, Carlsen B, et al. Study of peristomal skin disorders in patient with permanent stoma. Br J Nurs. 2006; 15:854-62.
42. Anselmi L, Antonini M, Bosio G, Fonti A, Gasperini S, Mastonicola G, Militello G, Morandell C, Pisani F, Scrocca A. A proposal for classifying peristomal skin disorder: results of a multicenter observational study. Ostomy Wound Management 2007; 53(9): 38-43
43. Antonini M, Bonaventura R, Militello G. Studio pilota sull'incidenza delle complicanze stomali e peristomali

nei centri stomizzati della ASL11 di Empoli e ASL4 di Prato. Atti del congresso AIOSS 2013.
44. Rolstad BS, Erwin Toth PL. Peristomal skin complications: prevention and management. Ostomy Wound Management 2004; 50(9): 68-77.
45. Antonini Mario. Le complicanze della cute peristomale: assessment e trattamento infermieristico In: A.I.O.S.S. Arte e scienza dell'assistenza infermieristica in stomaterapia: curare, prendersi cura, educare, a cura di Carla Saracco. Castellato (TE): Editpress S.r.l.; luglio 2021; 563-585
46. Antonini M, Militello G. Nursing management of a viscerocutaneous fistula. WCET Journal. 2012; 32(1):26-32.
47. M. Gray, JC Colwell, D. Doughty, et al. Peristomal moisture associated skin demage in adult with fecal ostomies: a comprehensive review and consensus. J Wound Ostomy Continennce Nurs. 2013; 40(4):389-399.
48. Cottam et al. Results of nationwide prospective audit of stoma complications within 3 weeks of surgery. Colorectal Disease. 2007; 9(9); 834-838.
49. Ndlovu S. The complication of mucocutaneous separation after stoma surgery. Gastrointestinal Nursing. 2015; 13(2):23-30.
50. Gray M, LeBlanc K, Whiteley I, McNichol L, Salvadalena G. Peristomal Medical Adhesive–Related Skin Injury. Results of an International Consensus Meeting. J Wound Ostomy Continence Nurs. 2019;46(2):125-136.
51. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Quick Reference Guide. Emily Haesler (Ed.). Cambridge Media: Osborne Park, Australia; 2014.
52. McNichol L, Lund C, Rosen T, Gray M. Medical adhesives and patient safety: state of the science: consensus statements for the assess¬ment, prevention, and treatment of adhesive-related skin injuries. J Wound Ostomy Continence Nurs. 2013;40(4):365-380.
53. Angriman I, Buzzi G, Giorato E, Barbierato M, Cavallin F, Ruffolo C, Degasperi S, Mari V, De Simoni O, Campi M, Zingales F, Roveron G, Iafrate M, Pucciarelli S, Bardini R, Scarpa M. Crohn's Disease-Related Stoma Complications and Their Impact on Postsurgical Course. Dig Surg. 2022;39(2-3):83-91. doi: 10.1159/000524036. Epub 2022 Mar 16. PMID: 35294945.nye
54. Nybaek H, Bang Knudsen D, Nørgaard Laursen T, Karlsmark T, Jemec GB. Skin problems in ostomy patients: a case-control study of risk factors. Acta Derm Venereol. 2009;89(1):64-7. doi: 10.2340/00015555-0536. PMID: 19197544.
55. C.C. Lyon, A.J. Smith, C.E.M. Griffiths, M.H. Beck, The spectrum of skin disorders in abdominal stoma patients, British Journal of Dermatology, Volume 143, Issue 6, 1 December 2000, Pages 1248–1260, https://doi.org/10.1046/j.1365-2133.2000.03896.x
56. Borglund E, Nordström G, Nyman CR. Classification of peristomal skin changes in patients with urostomy. J Am Acad Dermatol. 1988 Oct;19(4):623-8. doi: 10.1016/s0190-9622(88)70215-7. PMID: 3053801.
57. Jemec GB, Martins L, Claessens I, Ayello EA, Hansen AS, Poulsen LH, Sibbald RG. Assessing peristomal skin changes in ostomy patients: validation of the Ostomy Skin Tool. Br J Dermatol. 2011 Feb;164(2):330-5. doi: 10.1111/j.1365-2133.2010.10093.x. PMID: 20973766.
58. Bosio G, Fonti A, Pisani F, Scrocca A, et al. Studio osservazionale multicentrico sulle alterazioni cutanee post-enterostomie (SACS). Classificazione delle alterazioni peristomali. G Chir. 2006; 27:251-4.
59. Antonini M, Arena R, Gasperini S, Manfredda S, Militello G, Veraldi S. A revised version of the original SACS Scale for Peristomal Skin Disorders Classification. WCET J. 2016; 36:22-29.
60. Menin G, Roveron G, Barbierato M, Peghetti A, Zanotti R. Design and validation of a "Peristomal Lesion Scale" for peristomal skin assessment. Int Wound J. 2019 Apr;16(2):433-441. doi: 10.1111/iwj.13052. Epub 2018 Dec 13. PMID: 30548924; PMCID: PMC7949408.

iskills

a new vision
of health education

ISNN: 2785-7034 E-ISNN: 2785-7018

CALL FOR PAPERS

SUBMISSION DEADLINE
31.06.2023

TYPES OF PAPERS:

editorials - original scientific research - systematic reviews with or without meta-analysis - narrative, integrative, rapid and scoping reviews quality improvement reports case report - letters to the editor - cultural article

infermieristica journal

IL PRIMO PASSO PER LA RIABILITAZIONE È ALLA "DON GNOCCHI"

Centri di Riabilitazione
Fondazione Don Gnocchi
Dal curare al prendersi cura.

Fai il primo passo in uno dei nostri Centri di Riabilitazione in tutta Italia. Troverai **personale altamente qualificato, attrezzature all'avanguardia** e un'**assistenza personalizzata** per il tuo percorso riabilitativo.

Fondazione Don Carlo Gnocchi Onlus

Review

Pilonidal cysts: what's new? Technological innovations and the importance of Wound Management

Citation: Colella R., De Mola A., Azzarone F. "Pilonidal cysts: what's new? Technological innovations and the importance of Wound Management" (2023) *infermieristica journal* 2(1): 29-38. DOI: 10.36253/if-1898

Received: November 14, 2022

Revised: December 2, 2022

Just accepted online: April 5, 2023

Published: April 30, 2023

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Rosa Colella[1], Angela De Mola[2], Filippo Azzarone[3]

[1] RN, IRCCS Policlinico San Matteo Foundation, Pavia, Italy
[2] RN, ASST Ospedale Maggiore di Crema, U.O. Internal Medicine, Italy
[3] RN, U.O.C. of Resuscitation 1, University Hospital of Bari, Italy

Abstract: Pilonidal cysts typically manifest with the formation of ulcers or orifices, predominantly in the sacrococcygeal region. It generally affects young males between 15 and 30 years of age. It has a reported incidence rate of 26 per 10,000 people and affects men 2.2 times more than women. It often tends towards a chronic course if the correct diagnostic-therapeutic course is not taken. Surgical treatment of pilonidal cysts is only recommended in the presence of symptomatic disease and is the only effective treatment in this case.
Improper cleaning of the wound bed slows healing and may promote complications such as infection or biofilm formation, leading to recurrence. In addition to surgical or conservative treatment , an adequate assessment of the skin tissue is required by a specialist wound care professional who can recognise all local signs that impede healing.
Hence, the role of a specialist in Vulnology in the multidisciplinary team and the post-operative phase may be necessary to take care of the person in a dedicated outpatient clinic to assess the patient and adopt tailored local treatment strategies. The article proposes a narrative review of the latest available evidence, considering the last ten years, regarding the surgical approaches and new biotechnologies for wound management, with special attention to new treatment modalities and critical issues that are still to be investigated.

Keywords: Sinus, Pilonidal Cyst, Wound Care, Infected Wound, Nurse Specialist, Biofilm

Introduction

Pilonidal sinus disease (PSD) is a chronic and painful soft tissue disease mainly affecting young people. It is a socially disabling problem that causes physical and psychological suffering, significant financial burden to the patient, family, and community, as well as the health care system, given the high overall costs implied.

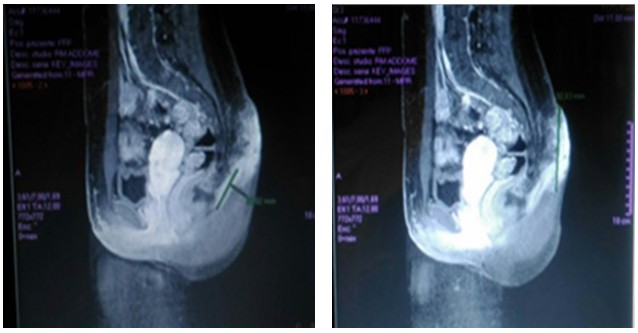
The expression Pilonidal Cyst is derived from the Latin "pilus," meaning "hair", and nidus, meaning 'nest.' The "pilonidal disease" (PSD), whose name was given by Richard Hodges in 1880 and first described in 1833 by Herbert Mayo, generally affects young males aged between 15 and 30 years[1].

Pilonidal sinus disease (PSD) usually consists of fistulas and cysts, more frequently located in the sacrococcygeal area and intergluteal groove between the skin and the subcutaneous fatty tissue, and the lesion only rarely reaches the muscular layer. The most common signs and symptoms of PSD include a swelling area, which is frequently painful and erythematous, and secretions that may be serous, hematic, purulent, maleodorant, and often associated with fever and malaise. In sporadic and severe cases PSD also causes fistulas[5].

The etiopathogenesis of pilonidal cysts remains uncertain. The hairs initially burrow into the dermis, creating an inflammatory reaction that spreads to the subcutaneous cellular tissue. Subsequently, a cavity is formed, creating primary and secondary orifices. During puberty, sex hormones stimulate the hair follicles and pilosebaceous glands, and, as a result, the hair follicle is stretched by keratin. Initially, the keratin obstructs the enlarged follicle; then, the follicle becomes inflamed and bursts, forming, in the end, a pilonidal microabscess. Certain positions, such as prolonged sitting, are more likely to favour this skin condition; moreover, the lesion is favoured by specific working or sports activities that expose the sacrococcygeal region to microtraumas[2]. In rare cases, PSD affects other body regions such as the penis, clitoris, scrotum, anus, scalp, chin, nose, face, neck, navel, groin, pubis, abdominal wall, axilla, sternum, breast, intermammary area and interdigital spaces . John Bascom's studies have shown how PSD is an acquired condition, albeit with a proportion of favourable genetic factors such as familiarity . PSD risk factors include male sex, family history, obesity, trauma or irritation, sedentary lifestyle, hirsutism, coccyx conformation and poor hygiene[1].

The diagnosis of PSD is based on objective examination; however, imaging may be supportive in targeting selected multi-recurrent and complex cases or excluding other diseases. Imaging includes ultrasound with a linear probe of skin and subcutis and nuclear magnetic resonance imaging (MRI) Fig 1. An anoscopy or proctoscopy may be helpful. Suppose one of the fistulous orifices is very close to the anus. In that case, performing an anorectal ultrasound with a 360° rotating probe is helpful to exclude a perianal fistula (differential diagnosis and exclusion of dual coexisting pathology).[5]

Fig. 1a/1b MRI of the sacrococcygeal region in patients with MP (Images courtesy of patient).



Pilonidal cysts and differential diagnosis.

Due to the clinical manifestation of pilonidal cysts, differential diagnosis with other dermatological pathologies should be considered, including hydrosadenitis suppurativa, pyoderma gangrenosum, perianal fistula, perirectal abscess, sacral osteomyelitis, furuncle, infected sebaceous cyst, actinomycosis, sacrococcygeal teratoma, sacrococcygeal chordoma or other presacral tumour, dorsal dermal sinus, Crohn's disease, luetic granuloma, tubercular granuloma, and desmoplastic neurotropic melanoma. Malignant degeneration of pilonidal cysts is a rare occurrence since, from the early 1990s, very few cases have been observed.[6]

Surgical treatment

Surgical treatment of pilonidal cysts is recommended only in symptomatic disease, representing the only effective treatment. The most traditional surgical procedure is **Marsupialisation** (Fig. 2), which consists of the en bloc removal of the granuloma, including its fistulous tracts and overlying skin. The open technique of marsupialisation involves the healing process of the residual cavity by second intention; in contrast, the closed technique involves direct saturation of the wound or by using sliding flaps.

Fig. 2a Open technique[7].

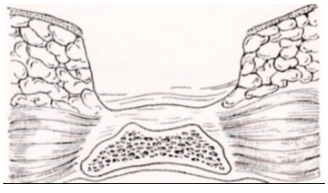
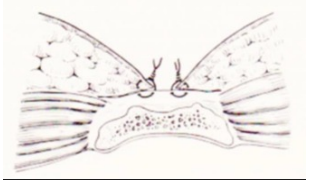


Fig.2b Technical marsupialisationa closed[7].



Other surgical techniques used over the years are described as follows:

Sinusectomy

It is a mini-invasive technique consisting of removing the dimples and midline sinus under local anaesthesia using a scalpel or scissors; this process leads to complete subcutaneous excision of the sinus tract.

Bascom Technique I (Pit Picking)

This technique, which was first devised in 1980, involves the removal of small hair entry holes and a lateral incision equal to the size of the fistula. The recurrence rate after pit picking is expected to be 8 to 26% in a period ranging from 12 and 120 months after surgery.[6-7]

Bascom II technique (Cleft Lift)

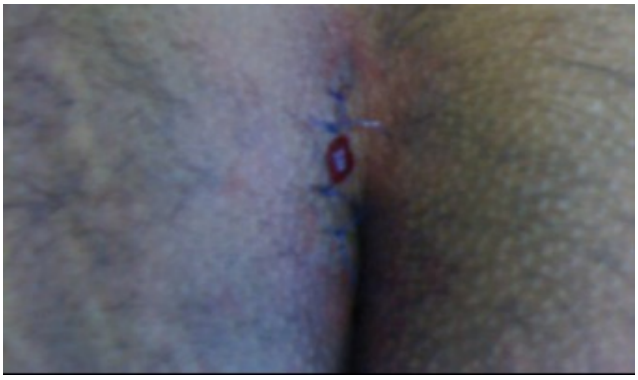
This technique, which was first devised in 1987, consists of removing breast tracts and creating a full-thickness stable skin flap across the cleft and closed off the midline. Adipose tissue is used to fill the previous space of the gluteal cleft. Wound dehiscence, mainly caused by infection of the subcutaneous seroma, is a recurrent event (15-40%).[8]

Gips' technique

More recently, Gips et al., have modified Bascom's technique, using a trephine of various diameters to excise the fossae and debride underlying cavities and tracts, thus removing only the cyst and fistulous tracts[9]. Biopsy punches (i.e., instruments with sharp blades to create a wound with well-defined edges that can be easily treated), can also be used to excise pits.[3]

Off-midline treatment indicates that the suturing technique does not occur on the midline but laterally (fig.4); notably, off-midline procedures are statistically superior to midline closure in terms of healing, as evidenced by a Cochrane review . Currently, many experts consider the off-midline approach a gold standard for pilonidal sinus management.[9]

Fig.4 Image of suture outside the midline after excision[12].



The future of Pilonidal Sinus Surgery: a shift to endoscopic treatments

The significant morbidity and recurrence of PSD have led to the development of less invasive endoscopic methods, such as the Video Assisted Anal Fistula Treatment (VAAFT), the Video Assisted Ablation of the Pilonidal Sinus (VAAPS) and the Endoscopic Pilonidal Sinus Treatment (EPiST). All these treatments, performed under local anaesthesia, are video-assisted using a fistuloscope. The procedures have in common a diagnostic phase of tissue exploration to identify incar hairs, infection, or abnormal tissue, followed by an antisepsis and healing phase in which wound cleaning, cautery of the fistula and subsequent closure are performed[10-11]. In 2020, a new method called EPSI-R (endoscopic pilonidal sinus resection) using a resectoscope was first described in the journal Techniques in Coloproctology. After introducing the endoscope and exploring the affected area, a resection of the injured area is performed, followed by irrigation with saline solution to remove cellular debris. After the cleaning phase, the authors described the use of phenol to promote healing. The procedure is performed during epidural anaesthesia[12] (Fig.5-6).

Fig. 5-6. EPSIT technique, images through fistuloscope.[13]

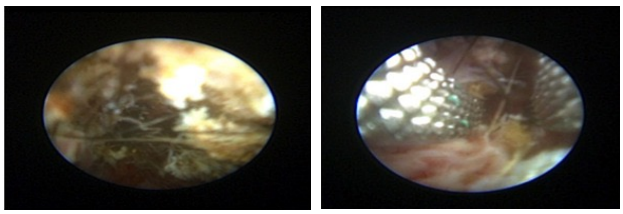


Table.1 Surgical treatment types of pilonidal cysts. Source: https://www.siccr.it (Italian Society of Colon-Rectal Surgery)[7]

Surgical treatments (SICCR,2019)[7]	
Plastic Surgery:	**Minimally invasive techniques:**
• Z' plastic • Cleft Lift or 'Bascom 2' • Rhomboid flap • Karydakis flap • Limberg flap • Lembo Gluteus Maximus • Bilateral Gluteal Advancement Flap • V-Y Gluteus flap • Upper Gluteal Perforating Artery flap • Triangular Crossed Flaps • Modified Dufourmentel flap with superior peduncle.	• Lord-Millar intervention (1965, involves the use of small pipe cleaners) • Bascom surgery (1980, small lateral incision and medial 'grain of rice' incisions • by means of a small-blade scalpel) • Sinotomy operation (2005, Al-Naami) • Gips surgery (2008, slight modification of Bascom, involves the use of biopsy 'punches' instead of the small-bladed scalpel) • Sinusectomy surgery (2011, Soll) • LIFT Technique (Ligation of Intersphincteric Fistula Tract) • Intervention of E.P.Si.T. (2014, Meinero) • Anal Fistula Plug (Armstrong, 2006) • Technique (EPSI-R) (Yuksel, 2020) • VAAPS and VAAFT technology • FILAC technique, laser fistula closure • Carotid surgery with cystectomy and fistulectomy (combines the principles and technique of Bascom's intervention with those of Gips)

Conservative treatments

Phenol injections

These are used for the treatment of mild to moderate pilonidal cysts. After using a curettage, phenol is administered through the existing orifices or dimples and left in place for 1 to 3 minutes, followed by saline washing [11].

Laser therapy

It is a new minimally invasive treatment. The presence and consistency of hairs can lead to an inflammatory response with sinus formation, so using a laser can help prevent future disease or recurrence [11].

Platelet gels

Some authors have described platelet-rich plasma or autologous adipose tissue as effective in reducing postoperative pain and accelerating wound healing[13]. A randomised controlled trial that examined the use of platelet gel compared with standard post-operative flat dressing found that the average healing time of the wound was 8.7 ± 1.18 weeks for the control arm and 4.8 ± 0.87 for the treatment arm ($p < 0.01$) [1].

Fibrin glue

Fibrin glue comprises a mixture of fibrinogen, thrombin, factor XIII, calcium and aprotinin. It is used in combination after curettage treatments of the fistulous tracts or after minimal excision of the midline dimples[14]. Studies reporting this approach are lacking; however, in a prospective study by Sian et al., a sample of 146 patients underwent simple scraping of the sinus tracts followed by fibrin glue application; the authors described that a curettage rate of 96% of the examined sample was obtained after at least two fibrin treatments; nevertheless, the evidence regarding this approach remains scarce[15].

Negative pressure therapy (NPTW)

NPTW used to treat chronic wounds facilitates granulation and healing process and can also reduce septic wound complications due to the continuous suction that keeps a clean wound bed and removes debris and bacteria (Figure 7). The quality of scientific evidence is low; however, in a 2012 randomised controlled trial, the NPTW approach appeared to reduce wound healing time, recovery and pain after surgery[16].

Other treatments

Medical honey

Medical honey exerts antibacterial action using a natural cleansing of the wound bed and oxidative activity. Saleh et al., (2022) evaluated the application of medical honey after pilonidal cyst resection for PSD with secondary intention healing; they found a shorter healing time in the intervention group, and the patients had a faster return to daily activities. [17]

Silver nitrate

Silver nitrate is a lytic agent widely used among wound care products and dressings to manage complex wounds. In several clinical conditions, such as perianal fistula, silver nitrate has been shown to accelerate wound healing by removing the excessive granulation tissue responsible for epithelial cell destruction and fibroblast activation . A retrospective study by Kanat et al., (2020) evaluated the cure rate and adverse effects of silver nitrate application in 56 patients affected by PSD and confirmed a generally high healing rate and low complications and recurrences in these patients.[19]

Collagen

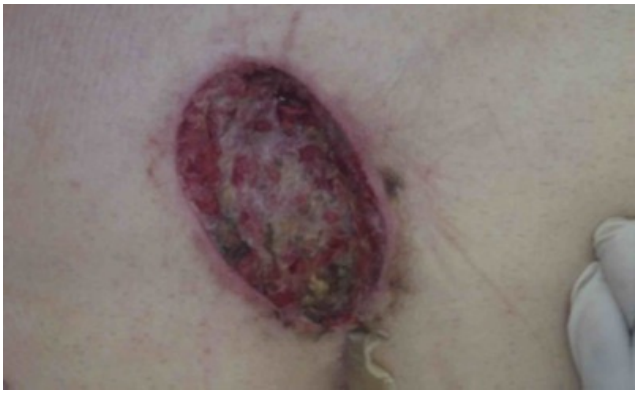
Collagen is a structural protein that gives the skin its tensile strength and draws fibroblasts and keratinocytes to the wound to promote angiogenesis and re-epithelisation. Collagen dressings stimulate new tissue growth and promote the deposition and organisation of new collagen fibres and granulation tissue in the wound bed. These dressings chemically bind to matrix metalloproteinases (MMPs) in the extracellular fluid of wounds. Collagen can therefore be a valuable contributor to helping rebuild new tissue. However, the wound bed must be clean and cleansed to favour its full function.[20]

Dressings with oil-reactive oxygen species (ROS) releasing matrix

Among the therapeutic innovations, these types of dressings are rapidly emerging. The oil-based medical device is enriched with oxygen, ensures the continuous release of ROS, and makes oxygen available in the wound site. This process contributes to maintaining suitable physical-chemical conditions (e.g., a low PH), and the interaction with the fluids present at the site indirectly supports and enhances the antibacterial and antifungal function, which is already typical of the inflammatory phase. As highlighted by clinical data, the release of ROS favours the establishment of a local microenvironment which in turn facilitates the subsequent release of the same ROS by the cells of the loco-regional immune system (typical of the inflammatory phase). This mechanism enables the establishment of a natural metabolic process. In addition, the oleic matrix allows for an optimal moist microenvironment, avoiding maceration of the wound bed and performing a protective film-forming action, which favours fibroblast proliferation and re-epithelialisation.[21]

Other treatments include autologous fibroblast or mesenchymal cell grafting and gelatinous thrombin matrix.[9]

Fig.7. Wound two days after excision of pilonidal cyst treated with NPTW.[23]



The importance of Wound bed preparation and wound management: the point of view of the nurse specialist in Wound Care.

The nurse Wound Care specialist has a fundamental role in care planning and local management of skin ulcers; depending on the approach or surgical technique one decides to undertake, pilonidal cysts can heal by first intention or secondary intention. The role of the Vulnology specialist can be crucial when surgery fails due to recurrences or infections; this figure is also essential to promote secondary intention healing through the use of advanced dressings and conservative treatments. The Vulonology specialist has acquired principles of tissue repair based on the TIMERS framework (fig. 8); this is a clinical reference tool for experts, which is considered the basic strategy in modern wound management because its adherence favours all tissue conditions leading to physiological repair[22]. Through this knowledge, the experienced practitioner acts according to best-practice; for example, they are capable of observing the tissue and detecting visual signs of chronicity, or complications, such as the presence of a suspected biofilm, which, if

untreated, represents one of the risk factors for non-healing; they are also prepared to choose the appropriate dressings and biotechnological innovations, tailored to the wound condition.

Cleaning the wound of bacteria that can appear dangerous and restoring the appropriate local conditions such as acidic PH and moist microenvironment are ideal conditions to promote physiological healing; these principles are systematically promoted through two approaches described here, Wound bed Preparation and Wound Hygiene, which, in addition to TIMERS, represent the most current wound management logics for the management of skin lesions (including those of surgical origin) that tend to become chronic.

Wound bed preparation

Wounds heal faster if they are clean and free of necrotic tissue, bacteria or other debris.

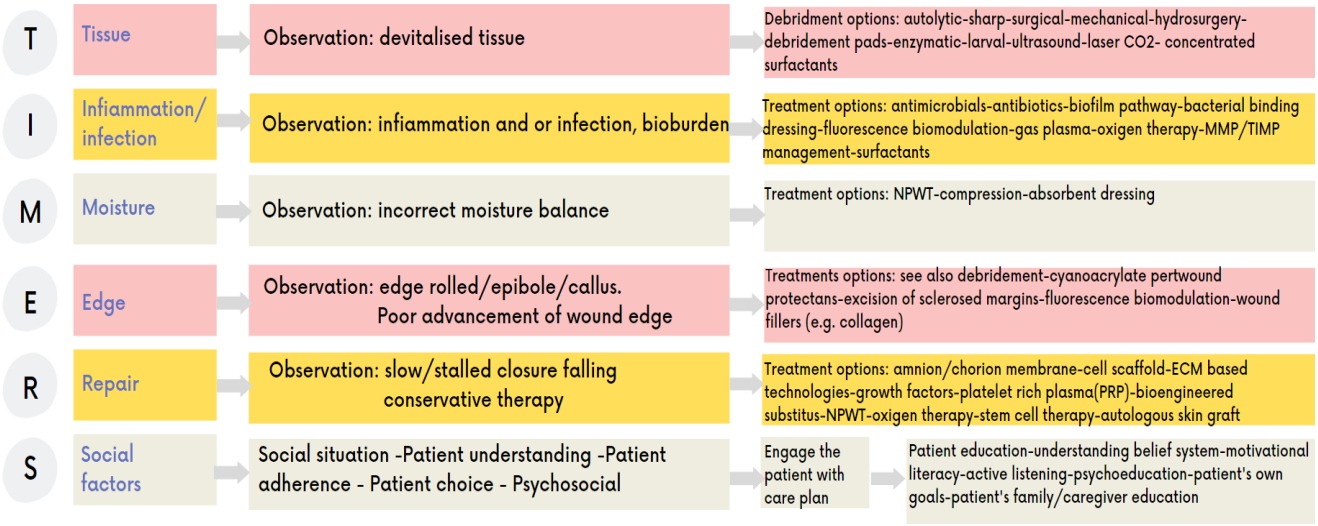
The cleansing process, or the action of washing and cleaning the wound/ulcer, is an essential step in wound management. The act of washing involves the removal of tissue debris, surface germs, any dressing residues and other poorly adhered but macroscopically visible surface materials that may impede and retard the proliferative process. According to good clinical practice, cleansing should be performed at each dressing change, using appropriate methods and materials, such as irrigation and rinsing, and removing dissolved material with gauze.[23]

In addition to sterile solutions such as the 0.9% saline, the literature supports using cooled, boiled or bottled water and ringer lactate. Recent evidence suggests that detergent solutions with surfactant action could also be used in addition to simple detergents (water and solutions mentioned above) at low concentrations or contain Polyhexamethylene Biguanide (PHMB), which in some cases directly facilitates biofilm breakdown.

Wound bed cleansing and decontamination strategies are part of the practices defined in the literature as Wound Hygiene (Fig. 9)[24]. A correct assessment involves an evaluation of the wound and the patient and possibly referring them to a specialised clinic. Knowing how to observe the tissue and its clinical presentation, in addition to history evaluation, can make a difference in the resolution of the clinical case. The observation performed during standard routine dressing manoeuvres can help suspect the presence of biofilm or infection.[16]

A correct assesment therefore involves assessing the wound and the patient, and if possible taking them to a dedicated clinic. Knowing how to observe the tissue and its clinical presentation in addition to evaluating the history can make a difference in the resolution of the clinical case. The findings that are made during normal dressing manoeuvres can be useful in suspecting the presence of biofilm or infection 16.

Fig.8 TIMERS framework for the management of difficult-to-heal wounds (Aktin, et al, 2019, mod.)[25]



Biofilm management

The biofilm is a community of microorganisms that adhere to each other on the surface of the ulcer; such bacteria are embedded in a matrix of polymers and sugars (EPS) and constitute a real 'barrier' against dressings and treatments, therefore hindering the healing process. Recent studies have shown that about 80% of chronic ulcers exhibit a biofilm, thus representing a significant problem to be considered.

Fig.9 The four steps of Wound Hygiene (Murphy C, et al, 2020, mod)[2] .

The presence of a biofilm is established by specific examinations such as skin biopsy, but the clinician may observe suspicious signs of biofilm that are as follows:[25]

- fragile bleeding tissue;
- medium or abundant dark red exudate (called haemorrhagic), indicating high bacterial and debris load;
- antibiotic therapy failure (biofilm has a barrier effect that does not allow penetration of antibiotics and non-targeted products);
- negative culture swab despite the presence of signs of infection;
- translucent background.

Biofilm formation involves 3 phases: the first phase is characterised by the attachment of bacteria to a surface; the second is the constitution and maturation of a colony, and finally, the detachment of the bacteria that may colonise new areas. Cleansing can dilute the bacterial load during the first phase; in contrast, mechanical debridement or surgery is required to promote biofilm breakdown in combination with targeted antibacterial products (Ag+, honey dressings, ROS-releasing, Iodine-containing) to prevent biofilm reformation.

Treatment of infection

Infection is a factor that promotes chronicity; as reported by international documents, antimicrobial agents for topical use are conditioned by the type of wound, also in relation to developed bacterial resistance. In Italy, antiseptics derived from chlorine are widely used (0.05% electrolytic chloride), also sustained by the evidence of histolesivity absence (i.e., they do not cause osmotic imbalance). The signs of infection are[26]:

- reddened and hot perilesional skin (cellulite);
- malodour;
- abundant purulent exudate: if Pseudomonas Auriginosa or Escherichia Coli colonise the lesion, the exudate may also appear greenish or brown, respectively. It can also appear haemorrhagic, which is an indication of a high bacterial load;
- perilesional swelling/oedema.

Clinical case:

A 23-year-old girl with a silent medical history and the onset of pilonidal cysts at 18 underwent seven surgical operations in five years: five sinusectomy operations, one using the Bascom technique6 and one using the Gips technique[3]. After each

operation and removal of the stitches, the lesions never healed entirely; instead, they showed signs of recurrence and infection from the beginning.

In November 2019, a Vulnology nurse specialist observed the lesion and suspected the presence of biofilm; the lesion was fragile and easily bleeding, with medium to abundant dark red (haemorrhagic) exudate. Cleansing of the lesion bed with an antiseptic cleanser containing PHMB (according to WBP principles) was initiated. A new-generation medical device was then applied; it consisted of a gel made of an oleic matrix that released reactive oxygen species (ROS). This approach allowed the creation of a suitable local microenvironment that favoured bacterial decontamination and guaranteed a humid microenvironment, thus restoring the conditions that led to a physiological restoration of proliferative processes. The management time for this lesion was approximately 2.5 months. After six years, the patient was able to benefit from total healing, resuming sports activities that had been suspended until then, and improving her quality of life. This clinical case highlights how the role of the clinical specialist can make a difference and provide appropriate and targeted support to resolve complex clinical cases.

Conclusions

Currently, PSD remains a significant problem in general surgery. Many surgical techniques indicate that a single approach towards therapeutic success is unlikely, which is also associated with frequent complications that lead to patient dissatisfaction and healthcare provider frustration. Moreover, what should be considered are the social and psychological aspects entailed, for which it would be helpful to provide support if necessary. Intuitively, PSD can harm the patient's quality of life, especially if the wound shows signs of chronic evolution. The Wound Care nurse specialists could play the role of case managers since they could plan personalised diagnostic-therapeutic paths and offer support to family members and other healthcare providers involved at the patient's home. Thus, the involvement of the specialist nurse in the team potentially guarantees uniform care planning and contributes to the dissemination of evidence-based procedures. Moreover, the possibility of a dedicated outpatient clinic for the care of hard-to-heal wounds may result in better continuity of care and improved healing process while at the same time reducing the need for readmission of the person in the clinical setting. Good documentation is also essential for ensuring the continuity of surgical wound care. Another additional value may be in promoting early recognition and interventions for surgical site infections.

References

1. Gips M, Melki Y, Salem L, Weil R, Sulkes J. Minimal surgery for pilonidal disease using trephines: description of a new technique and long-term outcomes in 1,358 patients. Dis Colon Rectum. 2008;51(11):1656-1663. doi:10.1007/s10350-008-9329-x.
2. Doll D, Bosche FD, Stauffer VK, et al. Strength of Occipital Hair as an Explanation for Pilonidal Sinus Disease Caused by Intruding Hair. Dis Colon Rectum. 2017;60(9):979-986. doi:10.1097/DCR.0000000000000795
3. Bosche F, Luedi MM, van der Zypen D, Moersdorf P, Krapohl B, Doll D. The Hair in the Sinus: Sharp-Ended Rootless Head Hair Fragments can be Found in Large Amounts in Pilonidal Sinus Nests. World J Surg. 2018;42(2):567-573. doi:10.1007/s00268-017-4093-5
4. Bascom J. Pilonidal disease: origin from follicles of hairs and results of follicle removal as treatment. Surgery. 1980;87(5):567-572.
5. Website: www.siccr.org. (Italian association of colorectal surgery's web site) viewed on 10/11/2022.
6. Vertaldi S, Anoldo P, Cantore G, et al. Histopathological Examination and Endoscopic Sinusectomy: Is It Possible?. Front Surg. 2022;9:793858. Published 2022 Mar 3. doi:10.3389/fsurg.2022.793858.
7. Segre D, Pozzo M, Perinotti R, Roche B; Italian Society of Colorectal Surgery. The treatment of pilonidal disease: guidelines of the Italian Society of Colorectal Surgery (SICCR). Tech Coloproctol. 2015;19(10):607-613. doi:10.1007/s10151-015-1369-3
8. Al-Khamis A, McCallum I, King PM, et al. Healing by primary versus secondary intention after surgical treatment for pilonidal sinus. Cochrane Database Syst Rev. 2010;1:CD006213.
9. Kober MM, Alapati U, Khachemoune A. Treatment options for pilonidal sinus. Cutis. 2018;102(4):E23-E29.
10. Milone M, Velotti N, Manigrasso M, Milone F, Sosa Fernandez LM, De Palma GD. Video-assisted ablation of pilonidal sinus (VAAPS) versus sinusectomy for treatment of chronic pilonidal sinus disease: a comparative study. Updates Surg. 2019;71(1):179-183. doi:10.1007/s13304-018-00611-2.
11. Meinero P, Mori L, Gasloli G. Endoscopic pilonidal sinus treatment (E.P.Si.T.). Tech Coloproctol. 2014;18(4):389-392. doi:10.1007/s10151-013-1016-9.
12. Yuksel BC, Aslan Y, Er S. Endoscopic pilonidal sinus resection (EPSI-R): a new method. Tech Coloproctol. 2020;24(10):1091-1092. doi:10.1007/s10151-020-02243-4.
13. Lesalnieks I , Ommer, A., Herold, A. et al. German National Guideline on the management of pilonidal disease: update 2020. Langenbecks Arch Surg (2021).
14. Win M, Went TR, Ruo SW, et al. A Systematic Review of Fibrin Glue as an Ideal Treatment for the Pilonidal Disease. Cureus. 2021;13(8):e16831. Published 2021 Aug 2. doi:10.7759/cureus.16831.
15. Sian TS, Herrod PJJ, Blackwell JEM, Hardy EJO, Lund JN. Fibrin glue is a quick and effective treatment for primary and recurrent pilonidal sinus disease. Tech Coloproctol. 2018;22(10):779-784. doi:10.1007/s10151-018-1864-4.
16. Banasiewicz T, Bobkiewicz A, Borejsza-Wysocki M, et al. Portable VAC therapy improve the results of the treatment of the pilonidal sinus--randomized prospective study. Pol Przegl Chir. 2013;85(7):371-376. doi:10.2478/pjs-2013-0056.
17. Salehi V, Yavari Barhaghtalab MJ, Mehrabi S, et al. Does application of honey improve surgical outcome in pilonidal cyst excision with secondary intention healing? A prospective randomized placebo-controlled clinical trial. Perioper Med (Lond). 2022;11(1):1. Published 2022 Jan 10. doi:10.1186/s13741-021-00237-w.
18. Attaallah W, Tuney D, Gulluoglu BM, Ugurlu MU, Gunal O, Yegen C. Should we consider topical silver nitrate irrigation as a definitive nonsurgical treatment for perianal fistula?. Dis Colon Rectum. 2014;57(7):882-887. doi:10.1097/DCR.0000000000000143.
19. Kanat BH, Yazar FM, Kutluer N, et al. Use of Silver Nitrate Application as Mini-Invasive Treatment of Pilonidal Sinus Disease. Chirurgia (Bucur). 2020;115(6):775-782. doi:10.21614/chirurgia.115.6.775.
20. Mathew-Steiner SS, Roy S, Sen CK. Collagen in Wound Healing. Bioengineering (Basel). 2021;8(5):63. Published 2021 May 11. doi:10.3390/bioengineering8050063.
21. Cassino R, Ippolito AM, Cuffaro P, Corsi A, Forma O. Evaluation of the effectiveness of a hyperoxidized oil-based medication in the treatment of skin lesions: observational study. Minerva Chir. 2015;70(1):23-31.
22. Atkin L, Bućko Z, Conde Montero E, et al. Implementing TIMERS: the race against hard-to-heal wounds. J Wound Care. 2019;23(Sup3a):S1-S50. doi:10.12968/jowc.2019.28.Sup3a.S1.
23. Bellingeri A. Handbook of wound care: for the prevention and treatment of skin lesions (Vulnology). 5th ed. Pavia: Editions CdG; 2019.
24. Murphy C, Atkin L, Swanson T, et al. Defying hard-to-heal wounds with an early antibiofilm intervention strategy: wound hygiene. J Wound Care. 2020;29(Sup3b):S1-S26. doi:10.12968/jowc.2020.29.Sup3b.S1.
25. World Union of Wound Healing Societies (WUWHS), Florence Congress, Position Document. Management of Biofilm. Wounds International 2016.
26. Swanson T, Ousey K, Haesler E, et al. IWII Wound Infection in Clinical Practice consensus document: 2022 update. J Wound Care. 2022;31(Sup12):S10-S21. doi:10.12968/jowc.2022.31.Sup12.S10.

27. Falanga V, Saap LJ, Ozonoff A. Wound bed score and its correlation with healing of chronic wounds. Dermatol Ther. 2006;19(6):383-390. doi:10.1111/j.1529-8019.2006.00096.x.

Case Series

Use of antimicrobial Dialkyl Carbamoyl Chloride (DACC) surface dressings for the treatment of infected post-surgical complications in neonates with low risk of adverse reactions: case series in the AOU Meyer NICU

Citation: Nicolosi B., Parente E. "Use of antimicrobial Dialkyl Carbamoyl Chloride (DACC) surface dressings for the treatment of infected post-surgical complications in neonates with low risk of adverse reactions: case series in the AOU Meyer NICU" (2023) *infermieristica journal* 2(1): 39-45. DOI: 10.36253/if-2105

Received: April 8, 2023

Revised: April 12, 2023

Just accepted online: April 22, 2023

Published: April 30, 2023

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Biagio Nicolosi[1], Eustachio Parente[2]

[1]RN, MSI, Wound Specialist, AOU Meyer IRCCS, Florence, Italy
[2]RN, MSI, AOU Meyer IRCCS, Florence, Italy

From the 3rd trimester of pregnancy onwards, the skin presents a structure similar to the definitive one. The maturing process continues until birth and continues rapidly until 2-3 weeks later, unless the skin is exposed to a high-humidity environment or is covered by occlusive materials, which can slow down its maturation[1]. The stratum corneum reaches functional maturity around the 33rd gestational week[2].

The first skin cells are formed from the ectoderm, from which those of the nervous system also derive, in fact because of this relationship, the peripheral sensory function of the skin is understood[2].

The ectodermal cells reach the intermediate cell stage before finally maturing into keratinocytes. Around the 7th week a cell layer (periderm) is present, which disappears around the 24th week, with the formation of scales. The specialised skin cells, melanocytes, Merkel cells and Langerhans cells, also begin to differentiate early, and from the 24th to 25th week, they start their activity[2].

At the 24th week of gestation, newborns have a reduced stratum corneum. The skin is red, wrinkled, translucent, and apparently gelatinous. The subcutaneous tissue is absent, so the dermis lies directly in contact with the bone[3]. Consequently, removal of an adhesive dressing or patch, with removal of the skin, may result in loss of full thickness tissue.

Between the 26th and 29th weeks of gestation, fat begins to be deposited at the subcutaneous level and wrinkles tend to diminish. However, the barrier function of the skin remains poor; in fact, around the 26th week of gestation, up to 110 ml of water can be lost

in 24 hours[3].

The main function of the foetal sebaceous glands is the excretion of sebum, a complex mixture of relatively non-polar lipids. In infants, the sebaceous glands are well formed, hyperplastic and macroscopically visible on certain areas of the body, such as the nose[2]. The surge in their activity during the last trimester of pregnancy leads to the production of a dense, lipid-rich hydrophobic film called caseous varnish. This film is present in varying amounts on the infant's skin surface, both in utero, where it protects the skin from maceration by exposure to the amnion, and at birth. After birth, a proportion of caseous varnish is physiologically reabsorbed, while it is necessary to remove the remaining part with oily substances, otherwise the lipids could go rancid and cause damage to the skin. Its removal must be partial, as it plays an important role in preventing water loss, thermoregulation and innate immunity[2]. The latter is indispensable in protecting the infant from sudden exposure to micro-organisms, toxins, oxidative stress, fluctuating temperatures and humidity, and is made possible by its content of LL-37 peptide and lysozyme, i.e. two antimicrobial substances that act synergistically, lactoferrin, alpha-defensin and other antimicrobial peptides[2]. The caseous varnish, therefore, acts as a natural moisturiser and protects the outer layers of the skin to allow normal adaptation in the new aerobic environment[2]. After removal, the skin is reddened and slightly cyanotic at the extremities. Capillary dilatation is frequently present at the eyelids, forehead and nape of the neck, but these regress spontaneously.

The combination of an evolutionarily and functionally immature barrier, the absence or reduced production of caseous varnish, the large body surface area in relation to mass and a still-deficient immune system exposes newborns to a significant risk of infections and skin lesions, particularly those born with a gestational age of less than 33 weeks[2]. A further consideration resulting from the skin characteristics of the preterm infant is the increased risk of percutaneous toxicity from topical drugs, cleansers and even emollients[2].

At 30 weeks, the subcutaneous tissue is evident and the stratum corneum has 2-3 thick cell layers, compared to 40 weeks, when it is 30 layers thick. Functional maturation of the skin occurs at 33 weeks, with the epidermis completely keratinised and the dermo-epidermal junction more resistant, although it remains fragile and easily damaged[3].

By the 36th week, the skin is structurally similar to that of the adult, although the epidermis and dermis are up to 60% thicker than the mature structure[3].

In a preterm infant, the epidermis is 55% thinner than in a full-term baby. The stratum corneum has the thickness of one cell, compared to 15 cells in the stratum corneum of a term baby. The immaturity of the stratum corneum of preterm infants leads to increased permeability, temperature changes, water loss, electrolyte imbalances and risk of infection. They also show an increase in skin cytokines compared to term infants, probably due to stress. In contrast, the stratum corneum of term infants has properties almost similar to those of adults. Preterm infants reach this level of maturation by 2-9 weeks of life[1]. In fact, there is evidence that, compared with gestational age, the skin develops rapidly within 2-3 weeks of birth and matures to the characteristics of that of the full-term infant[4].

Moisture in the environment and the maintenance of hydration at the stratum corneum are necessary for the normal desquamation process, as its interruption increases skin vulnerability, especially in preterm infants[5]. Physiologically, the epidermis and stratum corneum remain in equilibrium precisely because of the property of renewability, which reflects the distinct but closely related processes of hornification and desquamation[5]. Indeed, life in a dry environment requires protection from the constant dehydrating effects of exposure to air[5].

The formation of a barrier against trans-epidermal water loss is a direct function of gestational age: trans-epidermal water loss decreases dramatically with approaching term. This fundamental and vital postnatal function resides almost entirely in the 20 μm of the stratum corneum[5].

Another fundamental factor in the health of the skin of the preterm infant is the skin pH. The latter is essentially neutral, but rapidly develops an acid mantle through mechanisms distinct from bacterial colonisation: the development of skin acidity begins within the first 16 hours of life and is of particular importance, as it allows the inhibition of the proliferation of pathogenic bacteria, promoting instead colonisation by commensal micro-organisms[6]. The functions performed by the acid mantle, therefore, include antimicrobial defence and maintaining the integrity of the epidermal barrier[6].

Pre-term infants in particular, due to their inability to self-regulate temperature, display an additional aspect of skin vulnerability to the external environment. Central control of body temperature requires the activation of mechanisms, such as exocrine sweating and peripheral vasodilation/vasoconstriction, that are under the control of the autonomic nervous system. These functions are generally not adequately active at birth. This is

why newborns may have vasoconstriction of the extremities (acrocyanosis), large variations in red blood cell content (haematocrit) and blood volume. Peripheral cooling causes an increase in blood viscosity and a reduction in blood flow. After birth there is considerable reorganisation of the cutaneous vascular bed, with development of a sub-papillary plexus in the first 3 months of life[5].

Brown fat differentiates and deposits between the 26th and 29th week and skin folds slowly disappear, resulting in further difficulty in maintaining body temperature and acceptable glucose levels[3].

The anchoring structures of the epidermal cell (desmosomes, anchoring filaments, and haemidesmosomes) are smaller and less numerous.

All these differences result in a more fragile skin and greater skin permeability (increased trans-epidermal fluid loss, electrolyte imbalance, increased heat evaporation and increased absorption of locally applied products), especially in the preterm infant.

Wound healing in childhood occurs according to the four physiological phases: coagulation, inflammation, proliferation and maturation[7]. As has already been described, it is clear that there are intrinsic differences in the neonate, which influence wound healing and require special considerations, both for dressing choice and continuation of treatment[8].

Most of the evidence on the application of commercially available advanced dressings refers to efficacy compared with the adult population, so that in most cases, paediatric wound specialists have to adapt these products for paediatric use[9]. This inevitably also affects the availability of inadequately sized dressings for neonates especially[10].

The problem just analysed becomes even more impactful in the management of neonatal wounds when considering the formulation and contents of many advanced dressings. Indeed, these lack the evidence to guarantee their safe application in the neonatal, preterm and term population[9,10].

In the case of the treatment of infections, a further critical issue arises, since antibacterial substances may be responsible for allergic reactions, the emergence of resistance and toxicity.

The prevention or treatment of infection in neonatal wounds thus becomes a significant challenge for all specialists in the field, especially when one considers that in children under 10 years of age, 67% of category 3 pressure ulcers are critically colonised or infected; of these, from a microbiological point of view, 92% present a polymicrobial profile[12]. The reasons for this

Tab. 1 - Infant and adult skin: similarities and differences[11]

Structural differences	Infant skin	Adult skin
Epidermis		
Corneocytes	Smaller	Larger
Granular cells	Smaller	Larger
Stratum corneum and epidermis	Thinner	Thicker
Microrelief lines	More dense	Less dense
Depth of surface glyphics	Similar to adult	—
Facultative pigmentation (melanin)	Less	More
Dermis		
Dermal papillae (density, size, and morphology)	More homogeneous	Less homogeneous
Distinct papillary-to-reticular dermis transition	Absent	Present
Compositional differences		
Epidermis		
Natural moisturizing factor concentration	Lower	Higher
pH	Higher (newborn only)	Lower
Sebum	Lower (7–12 month-old infant)	Higher
Stratum corneum water content	Higher	Lower
Dermis		
Collagen fiber density	Lower	Higher (young adult)
Functional differences		
Rate of water absorption	Higher	Lower
Rate of water desorption	Higher	Lower
Skin barrier function	Competent	Competent
Transepidermal water loss	Higher	Lower

greater susceptibility to infection are multifactorial, for example, in the infant skin barrier, compared to that of adults, there is a high percentage of immature neutrophils, which have a compromised adhesion and phagocytosis function and are consequently more prone to develop bacterial infections[13]. Overall, there are multiple causes of increased susceptibility to infection of skin lesions in newborns; these include skin thickness, sparse dermal capillary bundles, physiological oedema capable of interfering with the transport of oxygen on the skin surface, huge critical colonisation at skin level, systemic immune depletion, salivary, faecal urinary incontinence, the small size of various parts of the body facilitating self-on-self pressure ulcers as well as skin lacerations, patients with the greatest number of devices per body surface area available when admitted to critical intensive care areas[14].

Antimicrobial dressings with a dialkylcarbamoylchloride (DACC) surface

Advanced dressings that sequester microorganisms, i.e. those with a hydrophobic, bacterial-binding surface (DACC), reduce the risk of clinical infection, without exposure to potentially sensitising, toxic or resistance-developing substances[15]. This technology is characterised by a fabric support treated with a fatty acid derivative (DACC - Dialkylcarbamoylchloride) that makes it hydrophobic[14]. Applied directly to the wound bed, it captures bacteria and fungi through hydrophobic interaction. Pathogens are irreversibly bound and removed at each dressing change[14]. The high antibacterial activity of the DACC-coated dressing occurs due to its irreversible binding and inhibition of the growth of bound bacteria[15].

The main antimicrobial dressings contain agents such as silver, iodopovidone and biguanides, which may have bactericidal or bacteriostatic action depending on the concentration and type of molecule. Today consensus and major guidelines discourage the prolonged use of antimicrobial dressings, which certainly should be used, but at certain stages of treatment and under specific conditions[16]. Their inappropriate application may expose them to possible antibacterial resistance.

At this point, effective alternative methods for the management of infected wounds become necessary to address the emergence of antimicrobial resistance and thus limit its spread.

Alternatives indicated by a World Union of Wound Healing Societies document[17], suggest that to reduce the possibility of the development of resistance to antimicrobial agents, the use of products with physical and mechanical action to remove bacteria is indicated. Indeed, these dressings do not release any antimicrobial agents onto the wound bed, thus preventing the risk of bacterial resistance and allergies, and act by retaining and sequestering exudate and bacteria, which might otherwise return to the wound bed.

Bacterial uptake dressings, therefore, are bacteriostatic dressings and not bactericidal; this 'passive' control of the bacterial load prevents the breakdown of the bacterial cell wall and the consequent release of bacterial endotoxins, which worsen the inflammatory state and prevent wound healing[15].

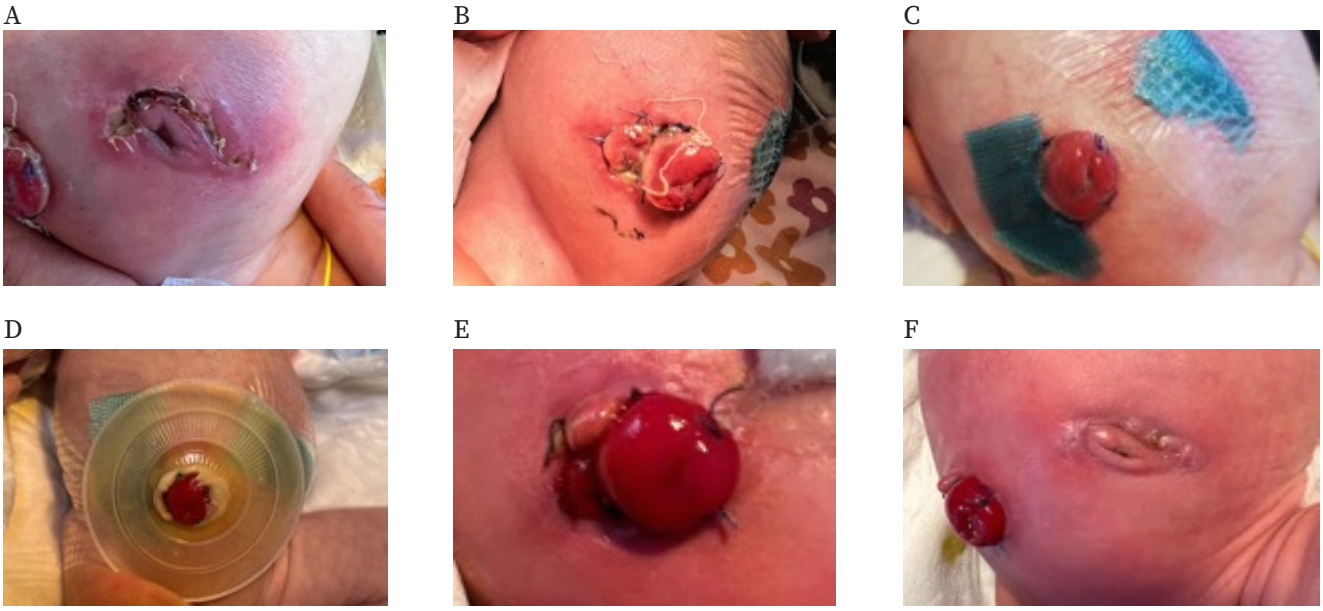
Thanks to its purely physical principle, it also does not release any potentially harmful antimicrobial agents, which could create a risk of bacterial resistance and allergies[18].

Series of cases

Figures 1- below show cases of complex neonatal wounds treated with bacterial-capturing DACC dressings with a hydrophobic, bacteria-binding surface.

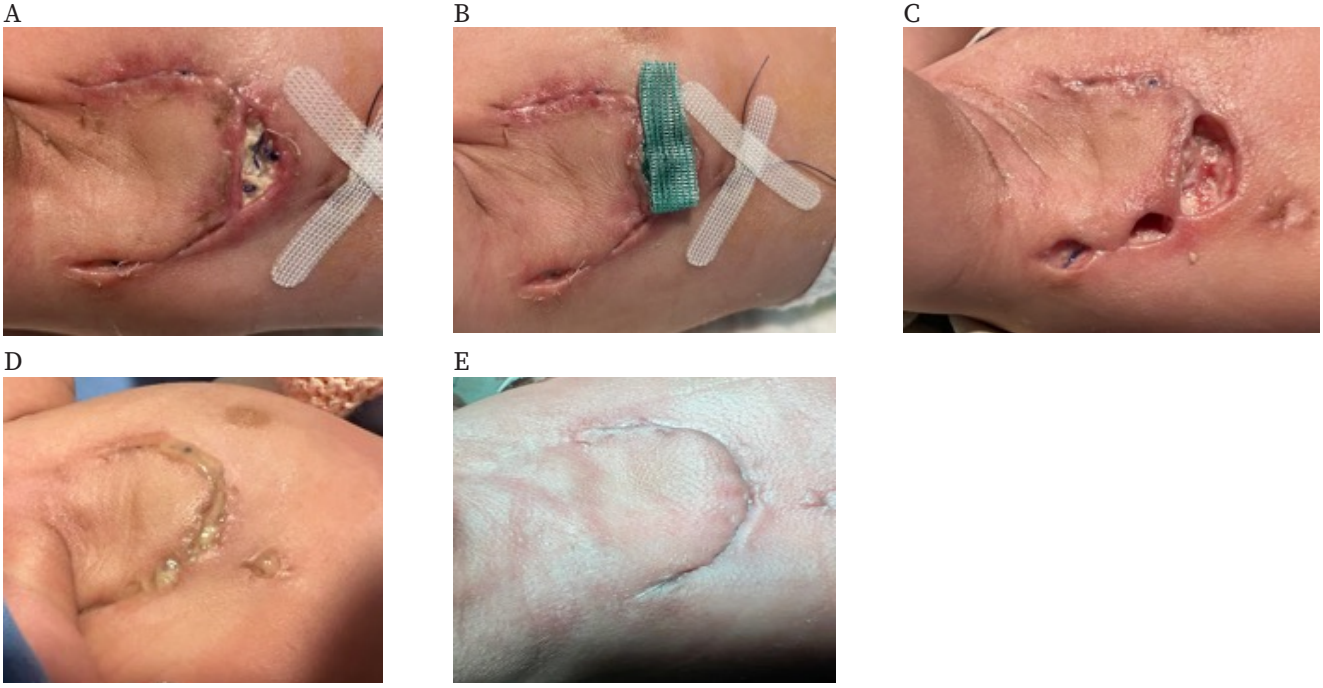
A) Complicated surgical outcome, with topical signs of infection, in 38 week-old infant with NEC. B) Peristomal lesion with dehiscence and signs of local infection. C) Bacterial gel dressing replaced every 48 hours for 10 days. D) Ostomy appliance with underlying dressing. E, F) Resolution of infection and dehiscence, optimal healing.

Figure 1: case of post-operative complication from ostomy placement.



A) Complicated surgical outcome, with topical signs of infection, in 40 week-old infant with tetralogy of Fallot and oesophageal atresia. B) Bacterial gel dressing replaced every 48 hours for 5 days. C) Fundus cleansed and ready for decisive treatment. D) Application of platelet-rich plasma. E) Resolution of dehiscence and optimal healing.

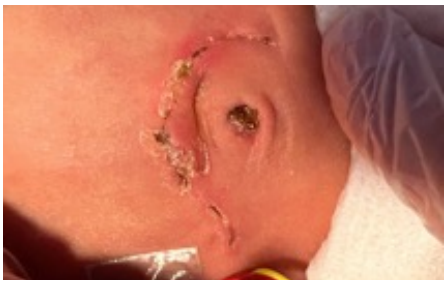
Figure 2: case of post-operative complication of oesophageal atresia surgery



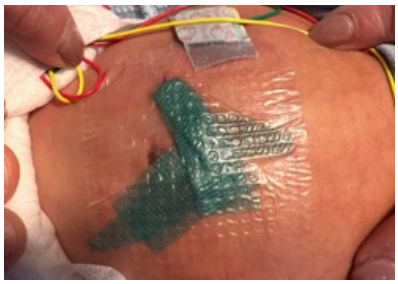
Notes: A) Complicated surgical outcome, with topical signs of infection, in 37 week-old infant with malrotation. B) Bacterial gel dressing replaced every 48 hours for 6 days. C) Resolution of infection and optimal healing.

Figure 3: A case of post-operative complication of intestinal recanalization surgery.

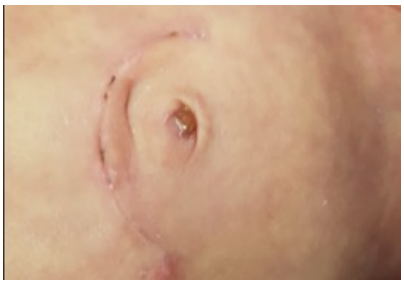
A



B



C



Conclusions

It may be concluded that the bacterial uptake dressing coated with DACC plays an important role in controlling the bacterial load of a wound, reducing the overall demand for antibiotics and without the use of antimicrobial substances. These characteristics do not lead to any known contraindications for use. Applications can be repeated without time limit and can be used on any type of patient, including newborns.

References

1. Teng J. M. C., Marqueling A. L., Benjamin L. T., Overview of Dermatologic Care in Children, Therapy in pediatric dermatology, Switzerland, Springer, 2017.
2. Gleason C. A., Juul S. E., Newborn Skin Development: Structure and Function, Avery's deseas of newborn, X Ed., Philadelphia, Elsevier, 2018.
3. Baharestani M. M., An overview of neonatal and pediatric wound care knowledge and considerations, Ostomy Wound Management, 2007; 53(6):34-55.
4. Irving V., Caring for and protecting the skin of pre-term neonates, J Wound Care, 2001, 10:253.
5. Polin R. A., Abman H. A., Rowitch D. H., Benitz W. E., Fox W. W., Physiologic Development of the Skin, Fetal and neonatal physiology, V Ed., Philadelphia, Elsevier, 2017.
6. Isaacs D., Skin and soft tissue infections, Evidence-Based Neonatal Infections, I Ed., Wiley, 2014.
7. Buganza Tepole A., Kuhl E., Systems-based approaches toward wound healing, Pediatr Res, 2013;73(4 Pt 2):553–563.
8. McNamara S.A., Hirt P.A., Weigelt M.A., et al., Traditional and advanced therapeutic modalities for wounds in the paediatric population: an evidence-based review, J Wound Care. 2020;29(6):321–334.
9. McCord S.S., Levy M.L., Practical guide to pediatric wound care, Semin Plast Surg, 2006;20(3):192–199.
10. White R., Rodgers A., O'Connor L., Anthony D., Paediatric wound care: neonates and infants, Wounds UK, 2016;12(3):8–11.
11. Telofski LS, Morello AP 3rd, Mack Correa MC, Stamatas GN. The infant skin barrier: can we preserve, protect, and enhance the barrier? Dermatol Res Pract. 2012;2012:198789. doi: 10.1155/2012/198789
12. Ciprandi G., Crucianelli S., Pomponi M., et al., Physical approach to infected pressure ulcers in a pediatric population: impact of a DACC non-medicated technology in bioburden management. Presented at: The EPUAP Annual Conference, 2018, Rome.
13. Visscher M.O., Utturkar R., Pickens W.L., et al., Neonatal skin maturation – vernix caseosa and free amino acids, Pediatr Dermatol. 2011;28(2):122–132.
14. Ciprandi G., et al., Meeting the Challenges in Pediatric Wound Care: Our 15-Year Experience with Dialkylcarbamoyl Chloride-Coated Dressing Technology in Acute and Chronic Wounds, Chronic Wound Care Management and Research, 2022:9 23–33.
15. Husmark J., Morgner B., Budi Susilo Y., Wiegand C., Antimicrobial effects of bacterial binding to a dialkylcarbamoyl chloride-coated wound dressing: an in vitro study, J Wound Care, 2022;31(7):560-570.
16. EWMA Document, Antimicrobials and Non-healing Wounds: An Update, Journal of Wound Management, 2022.
17. World Union of Wound Healing Societies, The role of non-medicated dressings for the management of wound infection, Wounds International, 2022.
18. Mosti G., Magliaro A., Mattaliano V., Picerni P., Angelotti N., Comparative study of two antimicrobial dressings in infected leg ulcers: a pilot study, J Wound Care, 2015, 24(3):121-2; 124-7.

INTERNATIONAL CENTER FOR

SELF CARE RESEARCH

www.selfcareresearch.org

Why Is Self Care Important?

People with chronic conditions must be actively involved in self-care. Of 8,760 hours in a year, only about 10 hours or 0.001% are spent with healthcare professionals. All other health maintenance, monitoring and management activities are done by individuals and their families as self-care activities. Performing self-care will improve well-being, decrease morbidity and mortality, and reduce healthcare costs.

Research has revealed the complexity of self-care. A wide variety of factors influence the decisions that people make about self-care. Significant knowledge gaps remain on how to influence those decisions in a manner that supports self-care. Our knowledge of the effects of self-care on outcomes is relatively undeveloped.

Our Mission

The vision of this Center is a world where self-care is prioritized by individuals, families, and communities and is the first line of approach in every health care encounter.

The mission of the Center is to lead the self-care research endeavor, improving conceptual clarity and promoting interdisciplinary work informed by a shared vision.

Case Report

An interplay between nursing's skills and new technologies in the home care: a case report of a complex ulcer

Citation: Sandroni S., Fabrizi S., Salutini E. "An interplay between nursing's skills and new technologies in the home care: a case report of a complex ulcer" (2023) *infermieristica journal* 2(1): 47-49. DOI: 10.36253/if-2138

Received: April 10, 2023

Revised: April 23, 2023

Just accepted online: April 26, 2023

Published: April 30, 2023

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Sara Sandroni[1], Stefania Fabrizi[2], Eleonora Salutini[3]

[1]Manager Network Wound Care – Azienda USL Tuscany SE
[2]Home Care Specialist Wound Care Nurse - Azienda USL Tuscany SE
[3]Director of Nursing, UOC Monitoring and Innovation - Azienda USL Tuscany SE

Background and aim

The increase in the phenomenon of chronicity and polypathologies, together with an organizational analysis of post-pandemic COVID-19 healthcare companies, has confirmed that the center of care is the home care sector. The phenomenon of chronic ulcers affects over two million people cared for with tracking difficulties, which is often a submerged phenomenon. Furthermore, more than 80% of all ulcers present show critical colonization, with organized biofilm colonies that are resistant to most treatments.

The gold standard for chronic ulcer treatment is as follows:

1. Standardized management with defined clinical skills
2. Use of evidence-based treatments[1]
3. Use of new technologies in the context of home care[2]

Clinical Case – Clinical Pathway

A 71-year-old woman with a heavily exuding stage III pressure ulcer in the left ischial region.

She had a history of paraplegia caused by a car accident, and had reconstructive plastic surgery at the hospital two years prior to the evaluation.

She developed weight loss 6 months after admission. A nutritional assessment was then conducted, and dietary monitoring performed, with the introduction of protein supports, essential amino acids, arginine, glutamine, and multivitamins.

After about 2 months, a new ulcer developed in the same area with full thickness loss, 1.5 x 1.5 cm and 2 cm from 360° undermined and partially covered by a non-vital area. There were high levels of exudate.

A multi-professional evaluation was carried out and a home treatment plan was planned in line with the patient's will,. The community nursing team, together with network wound care specialists, established a treatment plan using advanced dressings of different technologies according to the TIME-WBP evaluation, with a

frequency of three times per week.

After 20 days of treatment, the wound was considered hard to heal due to its increase in surface and absolute depth, despite different types of treatment and multidisciplinary reassessment.

The new plan included treatment with negative pressure wound therapy with controlled saline instillation (NPWTi) to clean the wound bed and stimulate tissue repair. Treatment was possible after definition of the clinical pathway, selection of a caregiver, training, and coaching by the wound care nurse specialist on how to manage NPWTi. Application of NPWTi resulted in a higher rate of granulation tissue reconstruction (43%, $p<0.05$) than treatment with standard NPWT. Normal saline solution was instilled with a 5-minute exposure, followed by 2 hour negative pressure wound therapy at -125 mmHg.[3]

Most of the wound debridement was performed after the first week of NPWTi application. Granulation tissue was observed after two weeks. After 21 days of NPWTi, treatment was switched to advanced dressings and silver hydrofiber dressings in combination with polyurethane dressings applied with a 2-weekly change for the first 20 days. Subsequently, treatment with advanced drugs continued according to TIME-WBP-BWAT massessment and clinical pathway.

Discussion and conclusion

This case report highlights how the right path of clinical management of a chronic wound found its right destination in the home context[4]. Therefore, promoting an organizational model, clinical and relational skills, and new technologies for the treatment of chronic skin lesions is really possible[5].

It is clear that the basic requirement must be an organizational model with defined skills and the availability of new technologies that can be used directly at home.

This case report shows how, with the patient's wishes and the additional skills of the caregiver, it was possible to achieve such a complex treatment at home.

Figure 1: Wound baseline

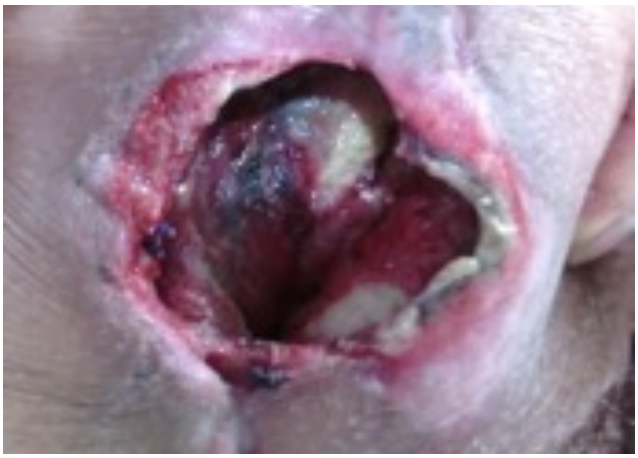


Figure 2: Wound at twenty days

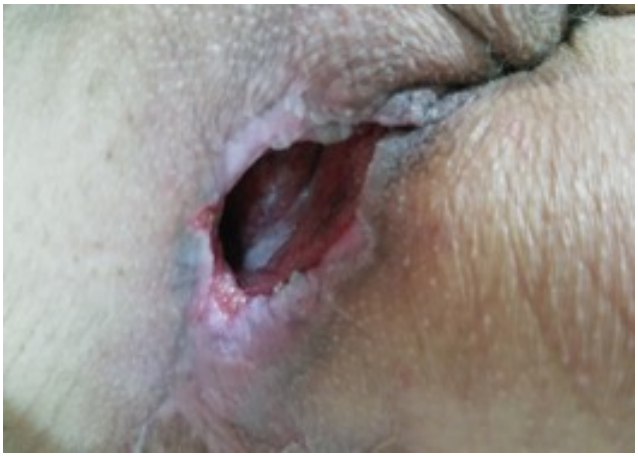
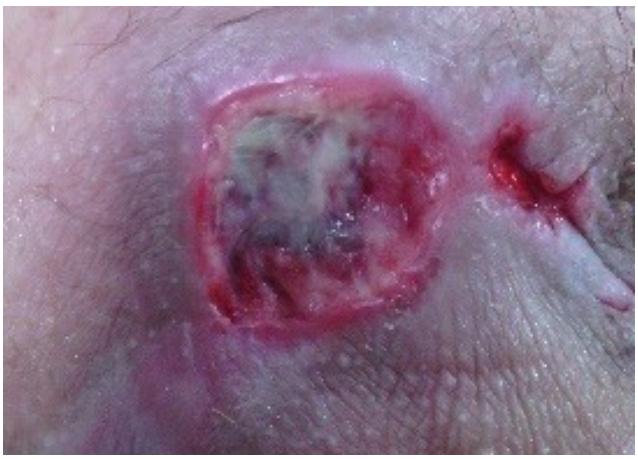
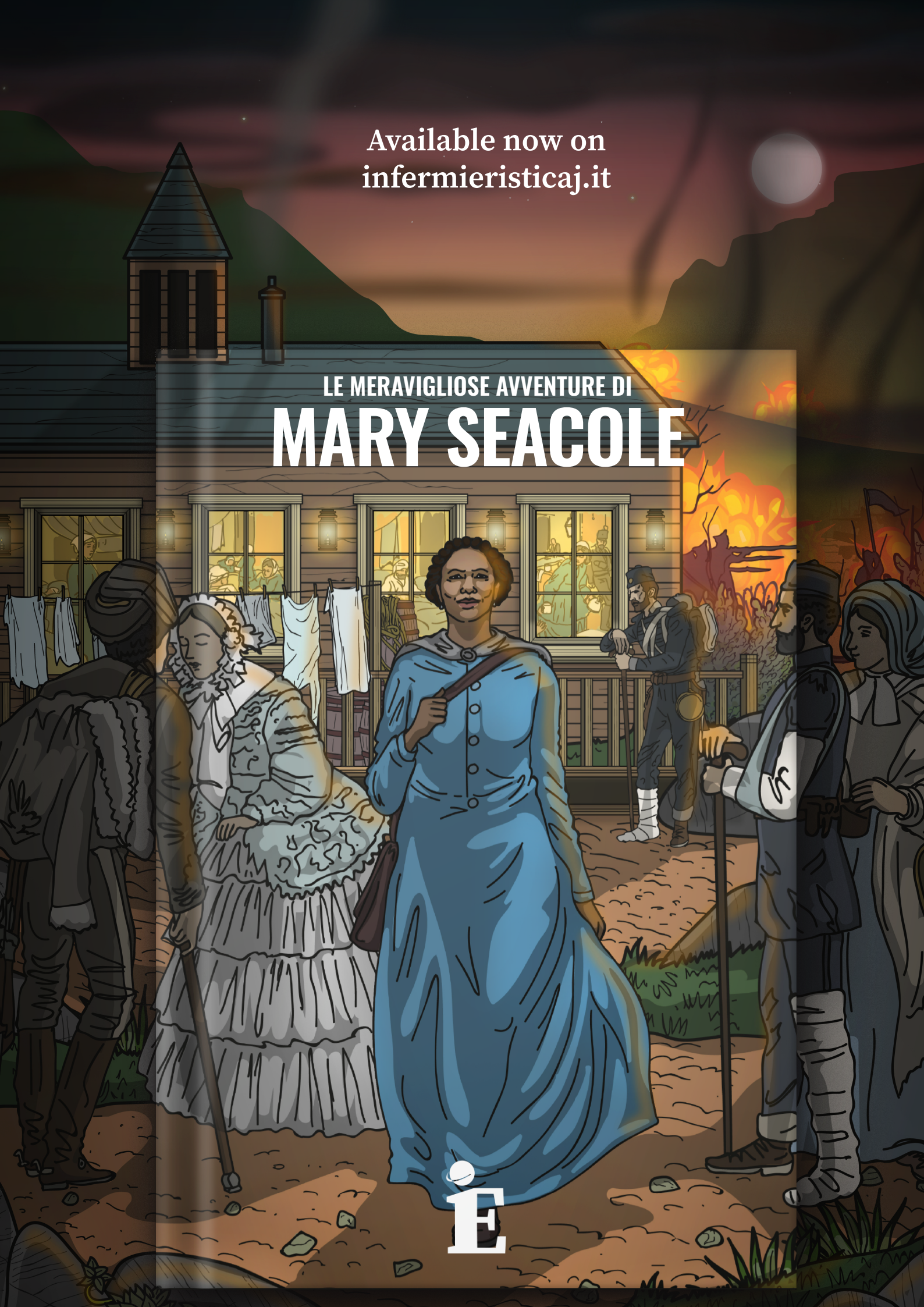


Figure 3: Wound at forty days



References

1. Lessing C, Slack P, Hong KZ, Kilpadi D, McNulty A. Negative pressure wound therapy with controlled saline instillation (NPWTi): dressing properties and granulation response in vivo. Wounds 2011 October 1;23(10):309-19.
2. McKanna M, Geraci J, Hall J et al (2016) Clinician panel recommendations for use of negative pressure wound therapy with instillation. Ostomy Wound Manage 62 (4):S1-S14.
3. Horch RE, Braumann C, Dissemond J, Lehner B, Hirche C, Woeste G, Wozniak G, Wetzel-Roth W, Willy C. Use of negative pressure wound therapy with instillation and Dwell time for wound treatment – Results of an expert Consensus Conference. Zentralbl Chir. 2018.
4. Gupta S, Gabriel A, Lantis J, Tèot L (2015) Clinical recommendations and practical guide for negative pressure wound therapy with instillation. Int Wound J 13(2):159-74.
5. Murphy C, Atkin L, Swanson T, Tachi M, Tan YK, Vega de Ceniga M, Weir D, Wolcott R. International consensus document. Defying hard-to-heal wounds with an early antibiofilm intervention strategy: wound hygiene. J Wound Care 2020; 29(Suppl 3b):S1–28.


Available now on
infermieristicaj.it
LE MERAVIGLIOSE AVVENTURE DI
MARY SEACOLE

Cultural Article

Negative Pressure Wound Therapy

Citation: Paggi B. "Negative pressure wound therapy" (2023) *infermieristica journal* 2(1): 51-54. DOI: 10.36253/if-2142

Received: April 2, 2023

Revised: April 13, 2023

Just accepted online: April 24, 2023

Published: April 30, 2023

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Battistino Paggi[1]

[1]*Wound Care Specialist, Italy*

Introduction

Negative Pressure Wound Therapy (NPWT) has ancient origins.

The historical summary of the NPWT use to improve wound care is briefly outlined below in Table n.1 and its effects on the wound bed in Figure n.1.

The use of NPWT has been constantly increasing due to the improvement of surgical techniques, the growth of technological potential, and the increased knowledge of the mechanisms of action induced by the mechanical forces of macro- and micro-deformation.

Negative Pressure Wound Therapy in the clinical practice

Currently, there are many areas in which wound care professionals use NPWT to manage wounds whose complexity is linked to factors that often cannot be managed.

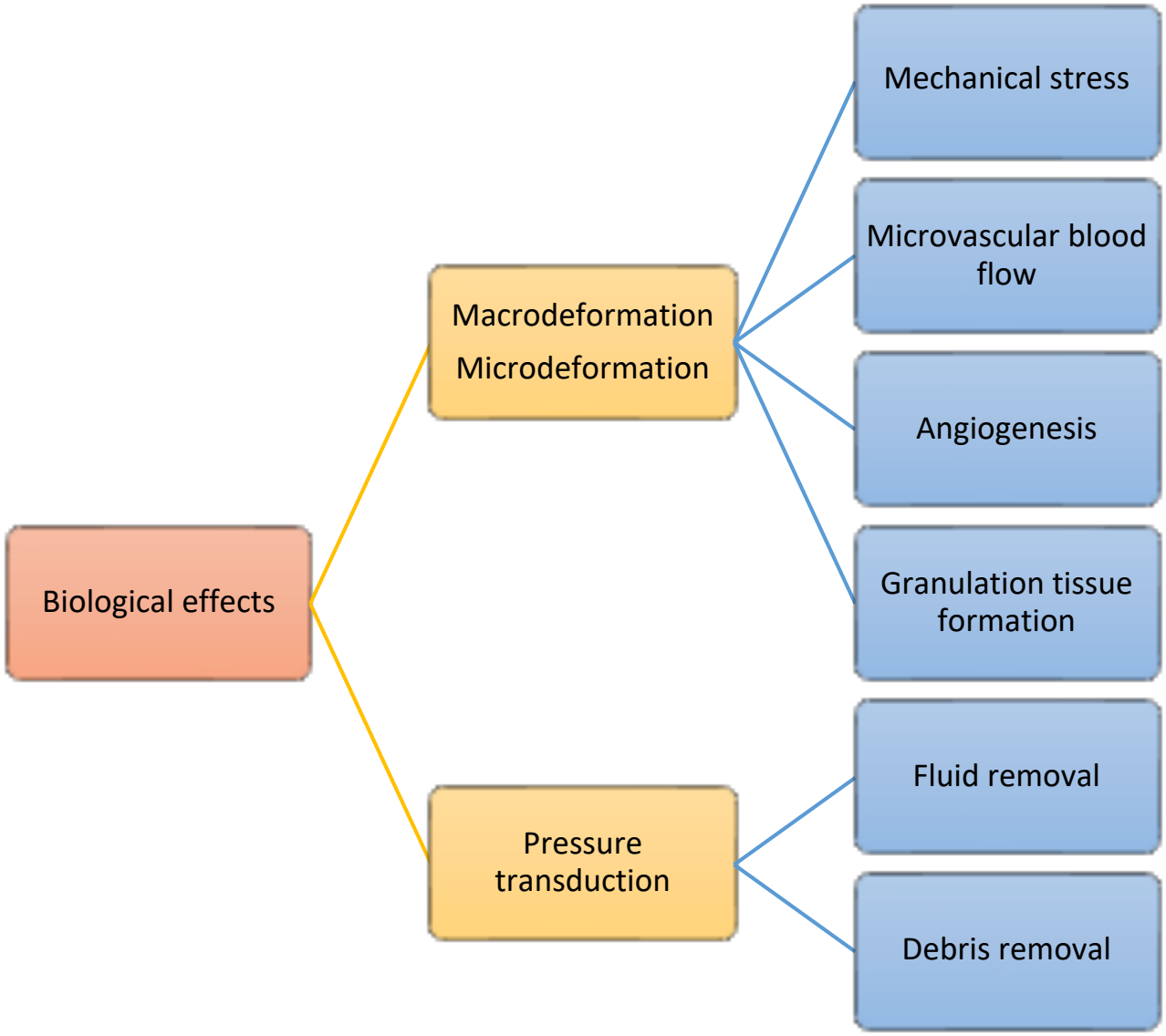
Exudate, size, rooting and other elements are the reasons for choosing a tool that has now become affordable for everyone.

Technological evolution has allowed the introduction on the market of ever smaller, stationary and disposable devices, available in advanced care centres as well as at the patient's own home. We can consider this element as the real breakthrough that has made the difference in NPWT treatment. However, this breakthrough was achieved thanks to the steps taken by the clinical practice combined with research. We need just to think about how much the application times have evolved, and the evaluation of the effects on the tissues has reduced the need for extremely lengthy treatments, favouring

Tab.n.1 NPWT historical references

NPWT History
• Primitive\Ancient Civilized people • Romane empire • Abu All Ibn Sina author of early medical encyclopedia • Cupping Technique mentioned in 1580-1588 • End of 18th Century "Suction Syringe" developed • Also in 18th Rubber Ball used to produce negative pressure • 1933 Scientist attempted to get invention certificate for negative pressure chamber • 1969 Finally got approved as a medical device
• 1986 Kremlin Papers
• 1989 (1984) Chariter and Jeter develop a new technique with gauze
• 1997 Argenta and Morykwas published: "Vacuum-assisted closure: a new method for wound control and treatment: clinical experience"

Fig.n.1 NPWT mechanisms of action



the choice towards reconstructive surgical treatments that are aimed at a more rapid resolution of tissue damage. The choice of dressing materials, foam or gauze, and its use in instillation form have favoured better control of tissue growth, cellular and microbial loads. The availability of disposable systems has become an important resource in the management of surgical wounds at risk of complication, and an equally important resource in the management of lower limb ulcers with exudate that is difficult to control (see Tab. 3). These management methods have in fact changed clinicians' choices and in particular the patient's quality of life.

Negative Pressure Therapy in the Guidelines

As NPWT technologies evolved and clinical applications has grown, the scientific community has increased its work to produce new and solid evidences to convey into clinical practice guidelines.

NPWT has showed to be effective NPWT is in reconstructive surgery, abdominal surgery in the presence of hypertension, dehiscence surgery, orthopaedic trauma surgery, cardiology, and the management of chronic wounds.

In table 2 are reported some good clinical practice recommendations to follow when using NPWT

Tab.n.2 Examples of good practice recommendations to follow when using NPWT

NPWT in Plastic and Reconstructive Surgery enhances the quality of tissue, as well as facilitating stabilisation of the tissue[1].
The combined regular cleansing and application of NPWTi-d are likely of greatest benefit in critically colonised or infected wounds[2].
Dressing selection for NPWTi-d therapy is dependent on wound characteristics of size, depth, tunnelling and underminin[2].
NPWTi-d does not replace debridement of the acutely infected, chronically infected or contaminated wound, and appropriate antibiotic therapy[3]
Some important outcomes for NPWT are: reduction of exudate from the open abdomen, early fascial closure, shorter length of hospital stay, lower mortality, lower rate of secondary procedures to reconstruct the abdominal wall and improvement in patients' quality of life[4].
Open fracture-induced soft tissue wounds and the closure of the dermatofasciotomy wound were the first reported indications for NPWT[5]
All complicated wounds, especially those larger than 50 cm2, with proven or high risk of infection, with soft tissue defect and exposed neuro-vascular elements, bony structures (including fractures and osteotomies) and osteosynthesis, after hemostasis, surgical treatment and debridement wounds [6]

Legend: NPWTi-d - Negative pressure wound therapy with instillation and dwell time

Conclusions

NPWT will certainly continue to be an undisputed therapeutic choice. The future will certainly hold surprises in terms of technology, supply and demand, Healthcare professional have the responsability to maintain their knowledge well updated to deliver the best care for patients needing to recover from wounds as soon as possible, reducing the rate of potential complications.

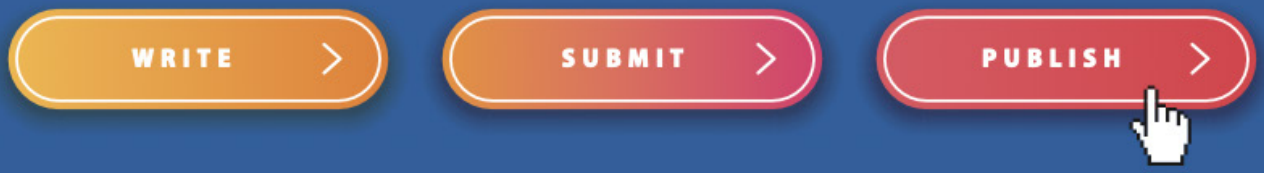
References

1. F.Duteille et Al. “Optimising the use of traditional NPWT in plastic and reconstructive surgery” Wounds International 2019 vol.10 Issue 4
2. S.Gupta et Al. “Clinical recommendations and practical guide for NPWT with instillation” IntWound J. 2016 Apr; 13(2):159.174
3. Kim PJ, Attinger CE, Steinberg JS, et al. Negative-pressure wound therapy with instillation: international consensus guidelines. Plast Reconstr Surg 2013;132:1569–79.
4. NICE “Negative pressure wound therapy for the open abdomen” Nov. 2017
5. Fleischmann,W., Strecker,W., Bombelli, M., Kinzl, L. [Vacuum sealing as treatment of soft tissue damage in open fractures]. [Article in German] Unfallchirurg 1993; 96: 9, 488–492.
6. Milan Slavkovic “Comparison of NPWT and classi Wet to Moist Dressing in the treatment of complicated extremity wounds in children” Children 2023,10,298

Remember:

if the results of your work aren't published by you, someone else will do it.

And he/she will take all the glory.



infermieristica
Editore

Journal Manager

Hamilton Dollaku
IRCCS Don Carlo Gnocchi
of Florence (Italy)

Editorial Team

Domenica Petta
San Giuseppe Hospital,
Empoli (Italy)

Sofia Tamburini
Careggi University Hospital,
Florence (Italy)

Camilla Bruschi
Santa Maria Annunziata Hospital,
Florence (Italy)

Ihssane El Garmoune
Santa Maria Nuova Hospital,
Florence (Italy)

Tommaso Mannocci
San Giovanni Di Dio Hospital,
Florence (Italy)

Camilla Zonzini
Integrated University Hospital
of Verona (Italy)

Simone Ghiribelli
Careggi University Hospital,
Florence (Italy)

Vittorio Bocciero
San Giovanni Di Dio Hospital,
Florence (Italy)

Floriana Pinto
ASST GOM Niguarda
(Italy)

Layout Artist

Pascal Miglionico

Scientific Board

Editor-in-chief

Laura Rasero
University of Florence (Italy)

Members of Scientific Board

Ahtisham Younas
Memorial University of Newfoundland (Canada)

Alberto Lucchini
San Gerardo Hospital, ASST Monza (Italy)

Alessandro Stievano
Center of Excellence for Nursing Culture and Research (Italy)

Andrea Cammarano
University of Rome – Tor Vergata (Italy)

Andrea Guazzini
University of Florence (Italy)

Anna Castaldo
IRCCS Santa Maria Nascente – Don Carlo Gnocchi Foundation (Italy)

Anna Rozensztrauch
University of Wrocław (Poland)

Antonio Bonacaro
University of Suffolk (United Kingdom)

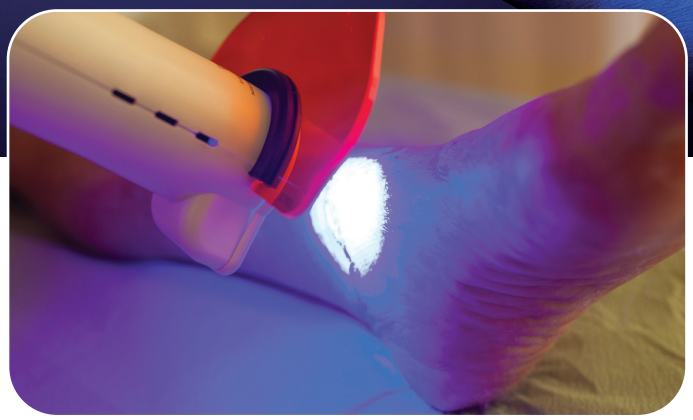
Duilio Fiorenzo Manara
Vita-Salute San Raffaele University, Milan (Italy)

Emanuele Buccione
Local Health Authority, Pescara (Italy)

Ercole Vellone
University of Rome – Tor Vergata (Italy)

Flavio Gheri
118 AUSL Toscana Centro – Florence-Prato (Italy)

FOTOBIOMODULAZIONE CON LUCE BLU IL COLORE DELLA SCIENZA CHE RIGENERA



EmoLED è un dispositivo medico che utilizza LED Blu per attivare la Fotobiomodulazione, una terapia innovativa per stimolare ed accelerare il processo di guarigione di ferite difficili ed ulcere cutanee.

Agisce direttamente, senza mediatori, sull'infiammazione ed il rimodellamento del tessuto cutaneo.

TRATTAMENTO EFFICACE, RAPIDO E SICURO.

www.emoled.com

emoled