JOURNAL EDITORIAL BOARD

Editor in Chief
Prof. Tomasz Banasiewicz
Poland

Prof. Marciniak Ryszard
Poland

Prof. Niezgoda Jeffrey A.
West Allis, USA

Prof. Malinger Stanisław
Poland

Prof. Osznisz Grzegorz
Poland

Prof. Pramod Kumar
Sofia, Bulgaria

Prof. Georgi Popivanov,

Editorial Board
Prof. Runkel Norbert
Villingen-Schwenningen, Germany

Prof. Becker Rolf
Koln, Germany

Prof. Salomone Di Saverio,
Bologna, Italy

Dr. Bobkiewicz Adam
Poznań, Poland

Prof. Sopata Maciej
Poznań, Poland

Dr. marek Maciej

Prof. Cirocchi Roberto

Dr. Cybulka Bartosz
Gorzów Wielkopolski, Poland

Dr. Trueman Paul
Hull, UK

Prof. Drews Michal
Poznań, Poland

Prof. Trzeciak Piotr
Belchatow, Poland

Prof. Dziki Adam
Łódź, Poland

Prof. Stojev Zoran
Shapka, Poland

Prof. Fraccalvieri Marco
Torino, Italy

Dr. Sukhbir Singh New Delhi, India

Prof. Heiney Jake P
Lambertville, USA

Prof. Szczepkowski Marek
Warszawa, Poland

Prof. Hudson Donald
Cape Town, South Africa

Prof. Siemionow Maria
Cleveland, USA

Prof. Huftan Martin
Bratislava, Slovakia

Prof. Stojcev Zoran
Shapka, Poland

Prof. Ichikawa Shigeru
Saitama, Japan

Prof. Wallner Grzegorz
Lublin, Poland

Prof. Kościrska Tomasz
Poznań, Poland

Prof. Wild Thomas
Hamburg, Germany

Dr. Krokwicz Łukasz
Poznań, Poland

Prof. Veverkova Lenka
Brno, Czech Republic

Prof. Krokwicz Piotr
Poznań, Poland

Prof. Angel Zorraino Bilbao Spain

Prof. Larichev B. Andreia
Jaroslav Russia

Prof. Zhou Ye-ping
Beijing, China

Prof. Mike G. Laukoetter
Muenster, Germany

Dr. Zielinski Maciej
Poznań, Poland

ACKNOWLEDGEMENTS
Cover: Joanna Francuzik

PUBLISHER
The Medigent Foundation deals with the introduction of new technologies in medicine. Mobile applications that support doctors’ decisions are of particular importance to us. To date, the Foundation has completed several projects with international partners creating new solutions in the field of medicine and new technologies. We would like to invite all interested parties to cooperate: innovators, doctors and new partners, to create new tools and solutions for medicine.
Medigent - A foundation in which doctors create solutions for doctors

SUBSCRIPTIONS
Negative Pressure Wound Therapy Journal is published quarterly by Medigent Foundation in Poland.
All content is publically available free of charge on the www.npwtj.com webpage. Readers who would like to be notified of new issues may register using a form on www.npwtj.com.

COPYRIGHT
All works published in this journal are shared under Creative Commons 4.0 Attribution Licence unless specified otherwise.
Statements and opinions expressed in the articles and communications are those of the individual contributors and not the statements and opinion of the Publisher.

DISCLAIMER
We take no responsibility or liability for any damage or injury to persons or property arising out of the use of any materials, instructions, methods or ideas contained herein. We expressly disclaim any implied warranties of merchantability or fitness for a particular purpose.

CONTACT INFORMATION
Address:
Negative Pressure Wound Therapy Journal,
Clinic of General Surgery, Gastroenterologic Oncology and Plastic Surgery,
Przybyszewskiego 49, 60355, Poznań

Telephone: +48 61-869-12-75
Fax: +48 61-869-16-84

Electronic mail: editor@npwtj.com
Web: www.npwtj.com

Publisher:
Medigent Foundation NIP: 779 245 69 65
ul.Grunwaldzka 66/2 Poznań, 60-311 Poland
www.medigent.org

TRADEMARKS
Trademarked names appearing in the pages of NPWTJ are property of their owners. The following list should not be considered complete: V.A.C. is a trademark of Kinetic Concepts, Inc.; Pico is a trademark of Smith & Nephew.

ACKNOWLEDGEMENTS
Cover: Joanna Francuzik

SUBMISSIONS
Editors of NPWT welcome all authors to submit their works for publication in the NPWT journal. We provide a thorough peer review and best recognition of your work. Send your work to our office by logging into our website: www.npwtj.com. Please use our online form to speed up the process.
TABLE OF CONTENTS

CASE REPORTS

SINGLE-USE NPWT DEVICE WITH TELEMEDICAL WOUND MONITORING IN THE TREATMENT OF ACNE INVERSA IN A PREGNANT PATIENT – CASE REPORT
Kinga Zastawnia, Alicja Zalejko-Strychalska, Tomasz Banasiewicz .......................................................... 4

EDITORIAL

INSTILLATION-TIME (ITIME) AS A RATIONALE AMENDMENT FOR TIME CONCEPTION. IS THERE ENOUGH EVIDENCE FOR THE EFFICACY OF NEGATIVE PRESSURE WOUND THERAPY WITH INSTILLATION (iNPWT) TO ANNOUNCE A BREAKTHROUGH IDEA FOR WOUND TREATMENT?
A. Bobkiewicz, A. Studniarek, L. Krokowicz, M. Drews, T. Banasiewicz .......................................................... 7
Single-use NPWT device with telemedical wound monitoring in the treatment of acne inversa in a pregnant patient – case report

Kinga Zastawna, Alicja Żalejko-Strychalska, Tomasz Banasiewicz

Abstract—Acne inversa (AI) is a chronic inflammatory skin disease significantly impacting the patient’s quality of life. Management guidelines for acne inversa during pregnancy do not exist. We decided to use a single-use negative pressure wound therapy (PICO, Smith & Nephew) while managing a pregnant patient with AI. Negative pressure wound therapy (NPWT) seemed to improve the patient’s condition, managing the exudation, reducing edema, and improving local regeneration, as well as epithelialization. The method was also absolutely safe for the fetus and feasible to conduct in the outpatient department - what was of utmost importance for the patient. The telemedical monitoring of wound healing using mobile technologies seems to be gaining importance for patients and medical practitioners. In the described case, we used the iWound (Polmedi, Poland) application in an outpatient setting.

Keywords—acne inversa, NPWT, telemedicine, iWound App, pregnancy, hidradenitis suppurativa

Case Report

Introduction

Acne inversa (hidradenitis suppurativa) is a chronic inflammatory skin disease, with a significant impact on quality of life. The disorder is generally difficult to treat and in pregnant women. There are limited publications and guidelines delineating treatment of acne inversa during pregnancy. We present a case report of a 30-year-old, pregnant woman, with moderate acne inversa treated with NPWT. We decided to use single-use negative pressure wound therapy (PICO), regarding the patient’s pregnancy. The local treatment of inflammation and reduction of septic condition was the main target of therapy. NPWT is as an effective and safe method in this type of wounds.

The main aim of this article is to emphasize the importance of vacuum therapy together with the constant telemedical monitoring of the wound healing, what we were able to achieve using iWound App (Polmedi, Poland).

Patient information and clinical findings

We describe the case of a 30 years old female patient, who presented with typical symptoms of acne inversa in the area of the perineum, both groins, and inner thighs. At the moment of admission to the hospital, the patient was 16 weeks pregnant. She was diagnosed with acne inversa ten years before the described incident when the symptoms developed in the axillary area, and she underwent surgery with a satisfactory effect. The patient described the present statement as “much worse and unbearable.” The symptoms included the presence of painful nodules, abscesses and sinus tracts forming fistulas with a tendency to tissue fibrosis. However, the disease seemed to have no remarkable effect on the pregnancy the patient reported that first symptoms occurred coincidentally with the pregnancy diagnosis. At that stage, she started developing anxiety and symptoms of depression. Due to potential adverse reactions to general anesthesia, we excluded broad surgical excision. We also had limited pharmacotherapy options due to the pregnancy. Additionally, the patient presented no other pathologies and concomitant diseases, no similar cases in the family medical history. The patient did not smoke nor use alcohol.

Therapeutic intervention

The patient was admitted to the dermatological ward and received conservative treatment. A team of physicians consisting of a dermatologist, gynecologist, anesthesiologist, and a surgeon were regularly consulting the patient and decided to perform surgical drainage of the inguinal abscesses under the short-term anesthesia. The surgical approach was limited to drainage of the lesions rather than performing the typically recommended radical procedure to avoid a possible compromise to the patient’s pregnancy. In patients with AI skin lesions less often cause sepsis or lymphadenopathy, but we were obliged to treat her due to an elevated risk of miscarriage.

The localization of the wounds and lesions was problematic for the regular NPWT dressing as we did not want to limit the patient’s movements, so we decided to introduce the NPWT using PICO (Smith & Nephew) soon after surgery. The small PICO system was easily changeable and removable
by the patient whenever leakage necessary. We continued
the NPWT for two weeks after the surgery, with the dressing
change every two days in the beginning and every three days
later (5 changes in total) and the concomitant intravenous an-
tibiotic therapy. Perioperative antibiotic therapy corresponded
to bacteriological tests, performed from lesional skin swabs,
taking the potential risk for embryotoxicity in concern (ery-
thromycin 600 mg i.v. three times a day and cefotaxime 2 g
i.v. twice daily for ten days).

After hospitalizing the patient for 22 days, we reached
the point when the patient could be discharged from the hospital
and instructed about the following home treatment, which
included topical application of ichthyol and starch suspension
twice daily. To keep the constant monitoring of the patient’s
wound, we proposed using a smartphone application, what
was potentially beneficial due to minimizing the need for
outpatient clinic visits. The patient enthusiastically agreed
to create an account in the test version of the iWound
App (Polmed, Poland), which offered an easy and fast
communication in case of any complications. There was
no requirement to keep the patient hospitalized neither in
dermatology or surgery department (due to the high risk
of infection in both wards) nor in gynecology or obstetrics
department (no pregnancy complications during the entire
period of pregnancy). We instructed the patient on how to
use the iWound App and how often she should contact
the doctor. She sent photographs by the application and
information about pain and color and amount of discharge
every three days right after she left the hospital, and once a
week 14 days later. She was also instructed not to hesitate to
contact the doctor if any pregnancy-related symptoms would
occur. However, she was strongly advised to stay under the
obstetrician’s care according to his recommendations. After
the surgical treatment supported by NPWT, we observed
no more severe activity of acne inversa. The patient was
monitored as an outpatient until she gave birth in the 38th
week. The patient did not require another hospitalization, and
the pregnancy was terminated on time by cesarean section.

Figure 1. Both treated inguinal areas on the day of the hospital discharge.

Figure 2. Photographs taken by the patient at home and sent by the iWound
App 6 weeks after she was discharged from the hospital.

**Discussion**

Although pregnancy is a physiological state, it brings much
anxiety when the patient needs hospitalization for unrelated
disorders. Being aware of this statement combined with an
infectious disease, which unquestionably is acne inversa, we
saw the need for a reliable ambulatory monitoring of the
patient. The treatment was aimed to minimize the negative
impact of AI rather than only introduce radical surgical
therapy.

NPWT seemed to be in this case well-suited for improv-
ing the healing potential, managing the exudation, reducing
edema, improving local regeneration, as well as epitheliali-
ization. The method was also, what was crucial for patients,
absolutely safe, and feasible to use in the outpatient depart-
ment. The other benefit was the reduction of the number
of wound dressing changes and reducing odor, which posed
discomfort for the patient. Single-use NPWT, as in our case,
is the easiest way to use NPWT in wound treatment after
surgery. The method is simple to use for the patient, and the
device operates with just one button. One potential difficulty
is the location of the wound dressing, which can introduce
problems to keep the vacuum dressing sealed. The experience
of the medical staff and the use of stoma paste as a sealant
is most suited for the proper functioning of the system,
especially in a complicated localization. In our case, we
did not observe any significant leaks; no extra visits to the
outpatient clinic or emergency wound dressing removal was
necessary.

With a holistic view of the patient situation, we tried to
address the difficulties that could occur regarding frequent
visits, spending time in public transportation or the risk of
nosocomial infections in the outpatient clinic. The telemedi-
cal application seemed to be well-suited and used by patients
and medical staff instruments for monitoring of wound heal-
ing with increasing frequency. In the described case the
iWound application was used — created by Polmed, Poland,
in collaboration with Chair and Department of General
and Endocrine Surgery and Gastroenterological Oncology
Department, Poznań University of Medical Sciences, Poznań,
Poland. In our and patient’s opinion, iWound is very easy to
use and allows for monitoring and permanent contact with the patient. It is personalized and stores all information together with the photographs of the wound, which is essential due to two aspects. First, it gives the physician the possibility of monitoring patient’s healing, second, provides both — the patient and the physician with the visual progress of wound-healing, what is vital from the psychological point of view.\[3\]

**Conclusion**

The ambulatory therapy of the wound, mainly including negative pressure wound therapy, require the regular control of wound healing due to early detection of potential problem and monitoring of the quality of healing. In discharged patients treated with NPWT, it seems to be very important to control the effectiveness of the therapy, early detection of some technical problems (leak, device’s alarms), control of type and volume of exudation, as well as to decide when the vacuum dressing should be changed. The smartphone application allows patients to control better and monitor the therapy as well as improve safety. Medical staff can benefit from it by optimizing the frequency of outpatient visits. It can reduce the number of non-necessary visits, as well as allow intervening in case of any acute complications rapidly. In our opinion, ambulatory NPWT treatment can be very effective when combined with telemecical systems for wound healing monitoring; the next step could be direct monitoring of vacuum devices by telemecical monitoring systems or mobile applications.

**References**

Instillation-TIME (iTIME) as a rationale amendment for TIME conception. Is there enough evidence for the efficiency of negative pressure wound therapy with instillation (iNPWT) to announce a breakthrough idea for wound treatment?

A. Bobkiewicz, A. Studniarek, L. Krokowicz, M. Drews, T. Banasiewicz

EDITORIAL

Abstract— An increased number of patients developing difficult-to-heal wounds results in billions spending for chronic wound care management. Introduction of TIME conception has been a breakthrough idea for wound healing based on phase-adapted wound therapy that interacts and influence each other and included: T — tissue management, I — infection control, M — moisture balance, E — edge of the wound. Negative pressure wound therapy (NPWT) revolutionized the management of wound healing. Moreover, recently NPWT with installation (iNPWT) has gained the popularity of optimizing wound healing.

In the context of acceleration of wound healing, iNPWT meets the criteria of the TIME conception. All individual components of TIME strategy are found in iNPWT providing “all in one” conception. Such management is easy to apply, monitor and it is well-tolerated by patients. Based on the current studies, iNPWT is found to be an important alternative for other methods of wound healing. It is believed that iNPWT will evolve and gain popularity as an innovative treatment for TIME conception.

Keywords—TIME, negative pressure wound therapy, installation, wound healing

Although, the general principles of appropriate management of wound bed preparation had been known even earlier, it was in 2000 when Falanga et al. published the report of the phase-adapted wound healing using the acronym TIME. This conception is composed of four individual elements that interact and influence each other:

1. tissue management,
2. infection control,
3. moisture balance and
4. wound edge.

The key TIME philosophy seems to promote significantly improved wound healing. Another breakthrough strategy that increased the rate of wound healing is NPWT. Since its introduction, NPWT has been considered a reasonably successful method for modern management of wound healing. In 1998, Fleischmann et al. combined the standard NPWT with a localized application of drugs. In 2003, the first commercialized system of iNPWT was introduced to general practice. It combines the benefits of standard NPWT with incorporated, controlled and periodic installation of topical solution to the bed wound.

In the context of acceleration of wound healing, iNPWT meets the criteria of the TIME conception. It was proven that iNPWT facilitates the removal of wound exudate, cellular debris and inflammatory molecules that may impair the process of appropriate wound healing (representing Tissue management). The use of topical solutions facilitates the wound decontamination resulting in bacterial biofilm reduction (representing Infection control). Composition of dressings with specially designed reticulated open-cell foam (ROCF) allows for appropriate adherence and distribution of instilled fluid within the wound. Moreover, application of instilled fluid keeps the moisture balance within the wound bed (representing Moisture balance). Negative pressure influences the re-epithelialization from the wound edges due to wound bed granulation, and remodeling of fibroblasts, extracellular matrix, as well as increased growth factor production. Using iNPWT, acceleration of wound filling and collagen deposition was observed within the wound bed, in both — experimental models as well as in clinical scenarios.

All above-mentioned mechanisms of action studied in in vitro and experimental studies were confirmed in clinical scenarios and in various types of wounds. Recently, a preliminary international consensus guideline was published to summarize the current state of the art regarding iNPWT. Moreover, further comprehensive reviews were published to
define the use, settings and instilled solutions for optimal utility of iNPWT indicating the increased value of iNPWT in the field of wound healing. Currently, iNPWT is used as a method of choice in open fracture, pressure ulcer and non-healing, complex postoperative wounds with a high rate of wound closure. In the recent multi-center prospective observational study, iNPWT was used for implant-associated infection following a knee or hip implant placement confirmed with the eradication of the wound infection in 75% of patients. Similar results were achieved by others indicating the low rate of reinfection and high rate of wound closure using a skin graft, flaps or secondary closure.

Based on our experience, iNPWT possesses the principles promoting wound healing and decisively fulfill the concept of TIME management. All individual components of TIME strategy are found in iNPWT providing “all in one” conception. Such management is easy to apply, monitor and it is well-tolerated by patients. Based on the current studies, iNPWT is found to be an important alternative for other methods of wound healing with an increased number of publications confirming its high efficiency. It is believed that iNPWT will evolve and gain popularity as an innovative treatment for TIME conception.

References


IMPROVING MEDICAL CARE
by supporting the use on new technologies in medicine

- clinical trials and observational studies
- medical registries
- mobile and web applications
- innovative medical devices
- telemedical and patient-oriented outcomes using mobile technologies

**PROJECTS**

**NUTRICIA Optima**
Application designed for conducting a clinical trial in the field of pre- and postoperative nutrition. Medigent Foundation created in cooperation with Nutricia mobile application processing data in this area. The application is available on all platforms.

**ECOLON**
Application designed for conducting and evaluating a clinical trial on a group of patients testing new medical solutions. The application has been improved with a system which monitors daily quality of patient’s life and data analysis.

**Medigent Leak**
Medical application for risk assessment of postoperative complications. The solution gives doctors a tool that supports their clinical decisions. Application enables to quickly and accurately estimate the real risk of postoperative complications of the patient. An additional advantage of the application is the ability to automatically generate printable reports, which significantly improves the work of doctors.

Foundation currently supports work on two IoT medical devices that will soon support home and hospital patient care.

**PARTNERS**

[Logos of various partners]