

Conference Report: LINK for Wound Healing Congress

Authors:

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The second LINK for Wound Healing Congress took place in Budapest, Hungary, on September 11, 2019. The conference and present report were sponsored by HARTMANN. The aim was to give delegates the opportunity to engage with key opinion leaders from around the world in the fields of advanced wound healing and negative pressure wound therapy (NPWT), charting the progress that has been made in both areas in recent years. The congress focussed on two areas: advanced wound healing and NPWT.

The World Union of Wound Healing Societies (WUWHS) document on exudate assessment and management (Wounds International, 2019) provides the most up-to-date guidance for clinicians. Marco Romanelli presented a summary of the document, highlighting the key points and how they can be applied in practice. He emphasised the importance of proper holistic assessment, the role that exudate plays and how high/low/abnormal exudate can affect wounds, and how this can be dealt with in practice. A structured and coordinated approach is required, and the consensus document outlining best practice is now available for more information.

The engineering perspective on exudate was explained by Amit Gefen, who outlined the results of a forthcoming mechanobiological study assessing its effects (Gefen, under review). Laboratory methods have now been developed that enable us to understand, analyse and learn from the composition of exudate. A cell culture model was used that determined the effect of physical conditions (low temperature, low glucose, low pH) on collective migration patterns of tissue repairing cells, and also to simulate and determine the effects of NPWT on a cellular level. Exudate plays a critical role and provides the environment that enables cells to migrate in the wound bed; the composition and properties of the exudate can vary considerably (e.g. watery/viscous, acidic/alkaline) and this has an effect on healing.



Marco Romanelli.

The cellular findings indicated that wound exudate should not be seen only as a clinical management issue: the composition of exudate has a direct effect on the migration of tissue-repairing cells in the wound bed. Exudate plays a key role in enabling cell migration and facilitating healing, so the composition and properties of exudate can have a significant effect. In the future, we may be able to actively alter the chemical and physical environment to influence exudate and optimise outcomes.

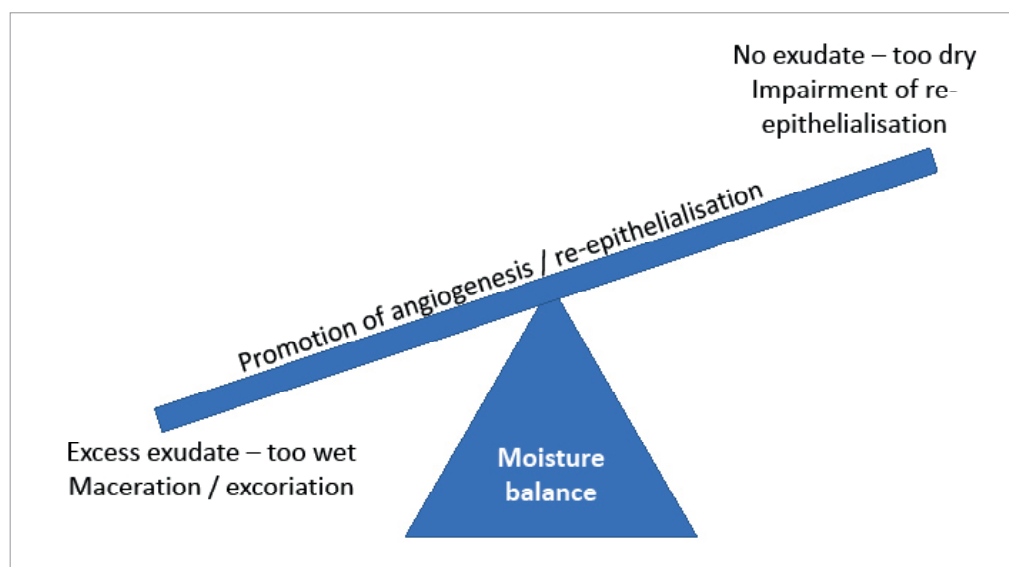
Paul Chadwick went on to look at the clinical aspects of exudate management, focusing on dressing choice in diabetic foot ulcers (DFU). While exudate plays an important role in the healing process, it can delay healing and cause further issues such as maceration, irritation and



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Figure 1. The moisture balance 'see-saw' (Bishop et al, 2003).



periwound damage (Wounds International, 2019). Achieving the correct moisture balance is the key aim and this can have a huge effect on the wound [Figure 1].

Dressings are the mainstay of exudate management and dressing selection forms a key part of treatment. However, factors such as availability/access and cost play a part and it's also important to consider clinician attitudes.

'Clinicians have preferences, but habitual behaviour needs to be examined when you're looking at the individual patient in front of you.'

While there are many considerations involved in dressing selection, the four main areas are tissue type, exudate level, treatment aims and local management options (Wounds International, 2019). Diagnosis and assessment are the most important elements that will affect future outcomes. Ensuing treatment may involve taking a 'jigsaw approach' to pull separate factors together, particularly in DFU management — e.g. debridement, dressing, comorbidities, exudate management.

It is important to remember that there is no one dressing that is suitable for use throughout the full course of healing — dressing selection will change as the wound is monitored and continues to healing. Exudate management is a key part of the process but the wound's individual needs will evolve.

Gulnaz Tariq continued the focus on dressing selection, but particularly in wounds with high exudate levels. She highlighted recent success found using superabsorbent polymer (SAP) dressings in practice, and showed case studies using Zetuvit Plus (HARTMANN) dressings in practice. Gulnaz emphasised the psychosocial impact that highly exuding wounds can

have on the patient, and the need for holistic patient-centred assessment to lead care. She also stressed the importance of a coordinated multidisciplinary team (MDT) approach, as there can be a disconnect between in-patient and community treatment, which causes gaps in patients' care. Clinician education in communication and documentation was also found to make a positive difference to overall outcomes.

In practice, it was found that using SAP dressings, which were able to prevent issues that typically cause patients concern, such as leakage and odour, had a positive effect on overall wellbeing.

Clinical aspects of exudate management

This second session of speakers was co-chaired by Amit Gefen and Gulnaz Tariq.

First, Astrid Probst expanded on the importance of the MDT approach, presenting a case series of 10 patients with hard-to-heal wounds (primarily DFUs) treated with Zetuvit Silicone dressing range. No skin damage was found, and the dressing could be used successfully under compression; patients also reported reduced pain at dressing change and subsequently improved quality of life.

Astrid stressed that an integrated approach is vital to success, rather than relying on 'top-down instruction'. The involved members of the team should include:

- Nurse
- General practitioner
- Advanced nurse practitioner in wound management
- Physiotherapist (movement and manual



Gulnaz Tariq.



- lymphatic drainage)
- Vascular surgeon (surgical debridement, mesh graft)
- Pathologist (analysis of biopsy)
- Microbiologist (analysis of swab)
- Anaesthesiologist (pain medication)
- Nutritionist.

Patient self-care also plays a vital role. Good results were achieved when the importance of offloading was explained properly to patients. Patients were instructed to stay off their feet and to use custom-made shoes; when they had been educated about the rationale, they were more likely to stick to the therapy and rest more.

Small changes within the department were also found to make a difference, such as removing footboards from the beds to avoid potential pressure damage and facilitating patient positioning to avoid worsening of oedema. For this presentation, Astrid Probst received the LINK Award for outstanding contribution in Exudate Management.

Next, John Schäfer spoke about exudate management in lymphoedema. Due to the leakage of lymph from the tissues, excellent wound care practices are essential in lymphoedema in order to avoid maceration and further damage to the skin, including development of inflammatory wounds due to erysipelas and fungal infection. Patient comfort is of particular importance.

John presented cases in which Zetuvit Plus Silicone was used in patients with

lymphoedema. This dressing was chosen due to its ability to absorb high volume of exudate, particularly when used in conjunction with compression therapy, as well as its ease of use in difficult-to-reach areas and good adhesion. The dressing was found to securely contain exudate, reducing the risk of maceration and associated infection. The silicone-coated wound contact layer was found not to stick to the wound, enabling atraumatic dressing change and protecting the wound edges.

John emphasised that successful lymphoedema management needs to be part of an MDT approach. While lymphoedema is not a curable condition, the management goal should be to provide 'consistent decongestion'. Compression therapy is vital, and patients should be supported and encouraged to engage with their own care (e.g. nutrition, motion and skin care) in order to optimise results.

Carsten Hampel-Kalthoff elaborated on the subject of oedema and lymphoedema, and the use of compression and superabsorbent dressings in management. Carsten also stressed that oedema has a huge effect on the patient's quality of life: pain, reduced mobility, exudate and malodour are some of the elements that impact the most on the patient.

Treatment requires a coordinated strategy, combining use of:

- Compression
- Lymphatic drainage
- Patient moving/mobilisation.

Carsten presented a case in which oedema with large volume of fluid and leakage was having a huge effect on the patient's quality of life. Educating the patient about the treatment options and ensuring engagement with treatment had a significant impact on the success of the treatment regimen. This included superabsorber dressings, compression, correct shoes and targeted movement. It has been shown that a coordinated plan and patient education helps to improve outcomes.

Next, Nataliya Malyutina presented on her use of Zetuvit Plus in severe/deep (third degree) burns. The mortality rate for these severe wounds is very high, even in developed countries. She explained that surgical debridement of non-viable tissue is required, followed by surgical restoration (e.g. grafting).

Following the surgical procedures, an atraumatic mesh dressing is used along with a secondary absorption dressing. A study was undertaken, comparing Zetuvit with cotton gauze as the secondary dressing, aiming to determine efficacy and develop protocol. It should be noted that Zetuvit is generally recommended for wounds with high exudate levels; this is not expected from post-skin grafting, so the dressing should not be left on for too long. The study concluded that Zetuvit increased comfort and reduced pain levels in skin graft patients. However, for transplanted skin grafts, a traditional dressing is sufficient.

Judit Daróczy went on to discuss lymphorrhea in exudate management of chronic wounds, which is an under-recognised problem, despite being a relatively common

condition. One of the key challenges in practice is maceration and the associated risk of infection. This is often not identified until complications develop, so there is a need for earlier recognition and treatment. Therefore, it is important to recognise the early signs and characteristics.

Crucially, lymphorrhea and maceration impact the skin's normal barrier function and make the skin very susceptible to infection, so complications occur in untreated chronic lymphorrhea. The lymph fluid increases pressure at a rate that the skin cannot cope with, making it vulnerable.

Dressing selection is particularly important as most dressings cannot manage the amount of exudate produced, meaning that maceration develops. Zetuvit is a good option, as it is designed to absorb high exudate levels. Good results have also been seen when used in conjunction with compression; this is particularly useful, as adequate compression should also be a key component of treatment. This has seen good results in practice, and was found to be time and cost effective.

Epithelialisation

The sessions on epithelialisation opened with Marjana Tomic-Canic introducing new research from the University of Miami, focusing on the role of keratinocytes in wound healing and epithelialisation. New approaches to this topic centre on the potential reversal of non-healing wounds.

When epidermal integrity is disrupted, wound healing kicks in to restore it — this



Amit Gefen.

is the role of keratinocytes. The complex communication between cells is involved in wound healing processes, comprising a 'well-orchestrated system' to complete epithelialisation. Conversely, in wounds that do not heal, cells cannot communicate and migrate. The 'edge effect' investigates stem cells 'lost' at the edge of the wound, via genomic analysis.

It is found that inhibition of cellular communication is a key factor in chronic wounds. Sharp debridement is an important part of treatment that has improved outcomes and decreased healing time. However, rather than removing all non-healing tissue via debridement, it is now potentially possible to convert a chronic wound into an acute wound by changing the cells and active growth factor signalling. As it is becoming apparent that cell biology can be changed, this is an important advance in future wound healing.

Hans Smola went on to explain growth factors and how wound healing can be enhanced. He noted that most of our knowledge comes from acute wounds; however, if healing becomes stalled, growth factors are destroyed by proteases and receptors cannot work, creating a vicious cycle of non-healing. Concentration of growth factors can be enhanced by reducing the volume of fluid.

The evidence shows that concentration of growth factors produces improved results, and this can be facilitated through use of hydrated polyurethanes to stimulate growth factors. This produces a better relative wound area production, improving outcomes.

Next, Franck Duteille discussed the use of HydroTac in superficial second-degree burns in children. He explained that this type of burn falls into one of two categories: spontaneous healing or requiring surgery. In this case, the focus is on spontaneous healing and the dressing requirements of these wounds.

The goals of the dressing include:

- Managing pain
- Managing infection/reducing infection risk
- Improving patient quality of life
- Improving healing time.

These burns are complex to manage, particularly in some cases that are in difficult areas. HydroTac saw good results: nurses found it easy to apply, and patients (along with their families) were very pleased with the improved healing rates and avoiding hospitalisation as a result. It was noted that initially medical staff

had some anxiety about using a new product, so it is important that they are trained and supported in adopting new protocols.

Jean Sendé continued the theme of HydroTac use in burns. His initial research has led to development of a new management protocol, which has seen excellent results in the department. This was built around the '4 Cs' in burn care:

- Cooling
- Cleansing
- Covering
- Comfort.

This includes use of HydroTac Transparent (Hydrosorb) for superficial cutaneous burns. The pathway has been very successful and the aim is to increase its use as best practice in these burns in future. In addition to this presentation, Jean Sendé received the LINK Award for the Congress Best Poster.

Use of HydroTac from the surgeon's point of view was given by Istvan Roczso, noting that there is a great deal of research available but practical guidance is needed. Documentation is essential and should include photographic images, recording accurate assessment and using a numerical classification system to ensure standardisation and objectivity.

For each patient, photographic documentation is carried out using Klonk Image Measurement, which enables the following assessment criteria:

1. Accurate definition of the wound surface
2. Definition of a 1cm border surrounding the wound
3. Definition of hyperkeratosis
4. Securing the wound surface: bacteria/biofilm
5. Measuring quality of granulation tissue
6. Physical description of the area under bandage (inflammation, oedema, necrosis, biofilm, secretion)

This is performed at each dressing change, and the documentation allows tracking over time periods (at least four weeks long for each patient). Outlining cases including DFUs and VLUs, he explained that the patient should be tracked and decision point for clinicians should always be: continue or change? Thus, the aim is to provide appropriate options for the patient as their treatment continues.

Next, Alper Sener explained that all wound care clinicians need to bear in mind that, in order to achieve wound healing, the wound bed must meet the following conditions:

- Well vascularised
- Free of devitalised tissue



- Clear of infection,
- Appropriate moisture balance.

As such, there are also certain requirements that must be met by any wound dressings:

- Eliminate dead space
- Control exudate
- Prevent bacterial overgrowth
- Ensure proper fluid balance,
- Be cost-efficient
- Be 'user friendly' for the patient and staff.

Alper went on to outline case studies that successfully used HARTMANN products, emphasising the need for individualised choices for each patient and their wound: 'listening carefully, what does the wound say?'

Hans Smola summed up the sessions, emphasising the importance of structured pathways and documentation, and measuring outcomes. Better coordination in care is needed to close the current gaps. All aspects of wound care need to be interconnected.

A key take-home message was the importance of the role of exudate — always look to the dressing for clues.

Negative pressure wound therapy

Running alongside the exudate management programme was one that focused on negative pressure wound therapy (NPWT), co-chaired by Tomasz Banasiewicz and Martin Hutan.

First, Lenka Veverkova concentrated on exudate management and NPWT, presenting a retrospective analysis of 388 patients treated with NPWT. She explained that trauma is the

biggest killer of human beings and that NPWT is now widely used in the treatment of trauma. While broadly speaking, NPWT was found to be a highly efficacious way of managing wound exudate, the healing of fractures following NPWT treatment was affected in a negative way. Lenka emphasised that NPWT treatment must be performed rationally for only the necessary amount of time. She concluded by stressing that a key motto should be "NPWT use, not abuse".

Next up was Zsolt Szentkereszty, who spoke about exudate management with NPWT (Vivano) in mesh suppuration after abdominal wall reconstruction with mesh. He presented the results of case studies, whereby patients had developed complications during surgery. Prevention of the implanted mesh was possible in 81% of patients ($n=17$), while primary wound closure was found in 71% ($n=15$) and secondary closure was possible in 24% ($n=5$). The treatment algorithm put forward by Zsolt was to: save the implanted mesh; insert a polyurethane foam into the wound bed; apply -120mmHg continuous NPWT; control exudate level. NPWT was successful in evacuating exudate from septic wounds and had a positive effect on mesh salvage.

Balazs Banky then took the stage to present a multi-centre randomised controlled trial (RCT) centring on prophylactic closed incisional negative pressure wound therapy (ciNPWT) for high-risk laparotomy wounds. A total of 300 patients had undergone wound-related emergency laparotomies. Balazs explained that NPWT offered the following benefits for these patients: effective exudate removal; decrease

in dead space; improved microcirculation; subcellular effects, i.e. growth factors, angiogenesis. The questions that Balazs and colleagues had asked prior to determining the suitability of individuals for ciNPWT treatment related to which patients would benefit, the length of care required, cost-effectiveness and determining whether there could be any technical problems.

Balazs emphasised that ciNPWT could become a primary choice in septic laparotomy for surgical site infection prevention should clinical superiority and cost-effectiveness be demonstrated in further high-quality, multi-centre RCTs. He suggested that the creation of a shared European NPWT/ciNPWT registry with detailed technical and outcome measures could be beneficial. For his presentation Balasz Banky received the LINK Award for an outstanding scientific contribution in NPWT.

Romane Hurel then presented her randomised, prospective, unicentric study on management of refractory ascites using NPWT. Postoperative ascites for cirrhotic patients is the most common complication after liver resection; reported rates range from 5%–56% (Ercolani et al, 2003; Chen et al, 2006). Five patients with a mean age of 68 years of age were managed with diuretics and NPWT with dressing changes taking place every 4 days, depending on tolerance. The ascites stopped and complete wound healing was seen after 5 days on average, while none of the patients developed ascites infection. In conclusion, NPWT enabled faster surgical wound healing in this patient group, reducing mortality and morbidity, with the results encouraging, albeit from a pilot study.

Laszlo Venczel highlighted the case of a 47-year-old male patient, focusing on complex wound care and exudate management using NPWT during abdominal compartment syndrome (ACS), which was caused by acute pancreatitis. Up to 4,000ml of exudate was evacuated from the abdominal cavity during the initial stages of treatment; this amount was very unusual, according to Laszlo, who explained that fluid loss decreased day by day after NPWT was introduced. Dressing change was performed every 3–4 days.

Forty-four days after the decompressive laparotomy, the NPWT foam dressing was removed and secondary suture of the skin performed. After 5 days of ciNPWT the abdominal wall closed completely. Sadly, the patient died suddenly due to a malignant cardiac arrhythmia, 2 days prior to planned departure from hospital. Laszlo concluded

that ACS requires a complex intensive care regimen and NPWT is a useful tool, making it possible to effectively manage complex wounds and exudate.

Laszlo was followed on the stage by Marie-Christine Plancq, who shone a light on the use of NPWT in the paediatric population; indeed, this is one area that has been under somewhat intense discussion in recent years. Two cases were presented by Marie-Christine — a neonate and a 15-year-old adolescent. Both patients had erythema and swelling, while skin necrosis also appeared in both patients. NPWT was used for reducing swelling and optimising tissue prior to skin grafts, which were performed between 30 and 35 days. Marie-Christine concluded that extravasation injuries are iatrogenic accidents. In addition to prevention and early treatment being recommended as the optimum management for these patients, NPWT can optimise treatment.

Alexandru Carap elaborated on using combined NPWT and omental flap for prosthetic femoropopliteal bypass graft salvage. He stressed that surgical site infection (SSI) poses significant threat to both limb and life, while subsequent sepsis poses management challenges in terms of treatment of infection and exudate management. A 20-year-old male presented with a sharp pain in his right thigh. Just 12 hours after admission, the patient became hypotensive, tachycardic and he developed a vascular fistula over the area of the haematoma.

Surgery was performed immediately where a ruptured superficial femoral artery aneurism was discovered. Sepsis related to an SSI was developed on postoperative day 9. A decision was taken to initiate NPWT over the omentum with granulation tissue beginning to develop over the muscle tissue. Multiple skin grafts followed. At 3 years follow-up, the patient now exhibits normal function of his right lower limb with slight oedema. Alexandru explained that NPWT, in conjunction with omental pedicles, was highly effective in this case, resulting in a resolution of sepsis.

Next, Adam Bobkiewicz explained that enterocutaneous fistula (ECF) is a challenging complication of visceral surgery. It is associated with high morbidity and mortality rates. Adam presented the results of a study that analysed 32 patients with ECF who were treated with numerous types of NPWT, including fistula VAC, tube VAC, silo VAC, fistula intubation and Pepe's technique. The most important clinical factor when considering spontaneous ECF closure were

high-output fistula and the presence of protruded intestinal mucosa. A multidisciplinary approach was recommended by Adam when managing ECF, with NPWT promoted as a safe and effective tool in the clinician's toolkit.

Ana Almeida outlined a case report of a woman with juvenile lupus and anti-phospholipid syndrome who had experienced a traffic accident resulting in traumatic injuries in both of her lower limbs. NPWT was used on the patient for a period of 2 months, at the end of which 100% epithelial tissue was obtained. Having undergone a bilateral iliac revascularisation and skin grafting, the patient was treated by a multidisciplinary team and with NPWT. The use of NPWT in this case reduced healing time and saw that the need for a long hospital stay was averted. It also reduced perilesional oedema, reduced infection and optimised tissue in the wound bed, while increasing quality of life.

Emilie Raimond began by explaining that invasive vulvar carcinoma is a rare disease, affecting 3–5% of women with an incidence rate of 2 per 100,000 women. Three case studies were presented of patients with a vulvectomy in the context of either a pre-cancerous lesion or vulvar carcinoma. All three patients were treated with NPWT, placed immediately postoperatively, in order to reduce secretions, friction and also accelerate healing for a period of 10 days. In all three cases, NPWT enabled immediate healing or minimal superficial disunity, making the case for this therapy as a key element in managing vulvar lesions.

Melinda Gadacsi presented on NPWT-induced effective wound healing in the treatment of vascular graft infections (VGI), which is associated with high morbidity and mortality rates. Between May and December 2018, eight patients with VGI-related SSI were treated with NPWT at Melinda's

facility. NPWT was chosen in this patient group to reduce oedema surrounding the wound, increase granulation tissue formation, stimulate circulation and decrease the wound size, before closing it until secondary wound closure. The average application of NPWT (80–90mmHg) was 9±6 days. During the initial observation period, which was 3–6 months, there were no instances of SSI or VGI reinfection, and all wounds healed.

Tomasz Banasiewicz took to the stage once more to conclude the day's session. He praised the LINK Congress for bringing together clinicians who use NPWT. He stressed that NPWT had now become one of the key tools in the clinician's toolkit, likening it to a knife in a surgery room. He added that it is a subjective decision whether or not to use NPWT and that establishing reliable data regarding its use is crucial for increasing knowledge in this area in the future.

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