Unlocking the potential of NPWT - 21st and 22nd March 2014, Frankfurt

5th International NPWT Expert Meeting - Highlights

Don Hudson began by challenging conventional understanding of the effects of negative pressure on perfusion in the peri-wound area. The widely held belief is that there is sub-atmospheric pressure adjacent to the wound, and that NPWT increases blood flow. At previous meetings Prof Malin Malmsjo has presented evidence that in defect wounds there is a hypo-perfusion zone close to the wound margin (0.5cm) and a hyper-perfusion zone further from the wound margin (2.5cm). By contrast, when the team at Cape Town used intracranial pressure transducers to measure the pressure on intact skin, they found that pressure was always slightly positive down to a depth of 1cm, and a reduction in tissue perfusion was observed using radioisotope perfusion imaging. More recently they have used thermal imaging techniques to demonstrate a lack of increased tissue perfusion during NPWT. A possible explanation for differences observed between investigators is that earlier experiments had used laser Doppler to measure blood flow which may not yield the best measure of perfusion. Their findings suggest that NPWT decreases perfusion thereby stimulating angiogenesis and subsequent granulation tissue formation.

Professors Don Hudson (South Africa), James Stannard (USA) and Norbert Runkel (Germany), with over 230 delegates, this meeting of Negative Pressure Wound Therapy experts in Frankfurt represented the largest number of countries at a Smith & Nephew NPWT meeting to date. As the volume of research and published papers on NPWT continues to grow, market delegates were the recipients of presentations and interactive discussions that exposed them to some of the most comprehensive new clinical developments in NPWT. In comparison to past events, the topics this year moved more towards NPWT as a preventative therapy versus the more traditional treatment of wounds.

After introductions from Co-Chair Professor Don Hudson, the meeting began with presentations giving new insights into the mode of action of NPWT, and the use of negative pressure on flaps, skin grafts, closed surgical incisions and fracture wounds.

Insights into mechanisms of action

Don Hudson began by challenging conventional understanding of the effects of negative pressure on perfusion in the peri-wound area. The widely held belief is that there is sub-atmospheric pressure adjacent to the wound, and that NPWT increases blood flow. At previous meetings Prof Malin Malmsjo has presented evidence that in defect wounds there is a hypo-perfusion zone close to the wound margin (0.5cm) and a hyper-perfusion zone further from the wound margin (2.5cm). By contrast, when the team at Cape Town used intracranial pressure transducers to measure the pressure on intact skin, they found that pressure was always slightly positive down to a depth of 1cm, and a reduction in tissue perfusion was observed using radioisotope perfusion imaging.

More recently they have used thermal imaging techniques to demonstrate a lack of increased tissue perfusion during NPWT. A possible explanation for differences observed between investigators is that earlier experiments had used laser Doppler to measure blood flow which may not yield the best measure of perfusion. Their findings suggest that NPWT decreases perfusion thereby stimulating angiogenesis and subsequent granulation tissue formation.

Shigeru Ichioka (Japan) produced equally compelling results to support the opposite hypothesis. Using an intra-vital microscopic technique to directly visualise the effect on microcirculation in a previously described animal model, the Japanese team confirmed that NPWT increased microcirculatory perfusion at the wound bed. In a follow up of their original work, it was found that the NPWT effect on blood flow enhancement was mediated by the release of Nitric Oxide from endothelial cells. It’s clear that the evidence available in this area is not yet conclusive, and that more studies may be required to clarify the real role of perfusion in the mode of action of NPWT.
Developing applications for NPWT

In this section four speakers presented early results of studies in challenging applications for NPWT.

Peter Maitz (Australia) described the difficulties of providing immediate aid for trauma and emergency cases in his country where it may not be possible to get expert care to patients for hours or even days. Using a number of highly challenging patient cases, Dr Maitz illustrated the use of NPWT, often as a last resort when other treatments had failed in major wounds. An adolescent with meningococcal sepsis collected days after contracting the disease had her legs debrided from the knee down to the ankle joints. With no possibility of finding flaps for such large wounds, they were covered with INTEGRA™, wrapped in ACTICOAT™ and left under NPWT. After months of treatment, these large and very difficult wounds healed successfully. Dr Maitz also described the successful use of NPWT to treat extensive and very deep self-inflicted petrol burns on the face, scalp, right upper extremity and upper body, and a single two-month application of NPWT to a hysterectomy wound that had failed to heal for three years.

Sudheer Karlakki (UK) described the increasing difficulties of performing hip and knee replacements in a population that is aging and presenting with more comorbidities and increasing BMI. In a busy orthopaedic unit, delayed wound healing affects mobilisation and length of stay, which directly impacts costs and bed planning. Mr Karlakki reviewed the accumulating evidence for the use of NPWT in closed incisions before presenting top-line results from two studies soon to be published from his own group. In the first study, on 120 hip and knee revisions, standard dressings or NPWT were applied in theatre to two groups after surgery. They noted a large reduction in length of stay for patients with wound related complications. In the second study (a 220 patient RCT) treating hip and knee primary arthroplasties with PICO™ or standard dressings, they were able to discharge patients with leaky wounds one day earlier with PICO. He concluded that NPWT helps to achieve predictable wound healing, minimise wound complications and reduce LOS.

Norbert Runkel summarised the ongoing work of the NPWT Expert Panel with regard to management of the open abdomen (OA). Strong evidence is scarce but there are sufficient studies on which the panel were able to base recommendations. The consensus group agreed that among critically ill or injured patients with OA, there is a strong recommendation to use NPWT. NPWT must be goal-oriented in OA: protect, manage, close. If the goal is to encourage healing of a closed incision in a high risk surgical wound then prophylactic NPWT during closure may be useful. If healing by secondary intention is needed, NPWT can help to develop granulation tissue. Evidence shows NPWT is a key technique in the management of OA and has different actions at different stages of the disease. A treatment pathway has now been developed by the group for the use of NPWT in OA providing clear practical guidelines on when to use it, where to use it and for how long.

Frank Duteille (France) summarised the evidence available on the use of NPWT over skin grafts and in reconstructive surgery. NPWT should help maintain contact of the graft with the wound bed and avoid shear forces thereby enhancing vascularisation, minimising haematoma and removing exudate. A number of papers have been published recently describing the growing experience of applying NPWT to various split thickness skin grafts (STSGs). All report that NPWT increased the quantity and quality of STSG grafting, particularly in technically difficult wounds. Duteille favours a low pressure setting and a first dressing change at day 5. NPWT has been applied to all types of grafts but has been particularly useful with irregularly contoured and technically difficult wounds and those with a suboptimal wound bed. PICO, an ultra-portable form of NPWT, has also been popular with patients who could be discharged immediately after the graft.

In the opinion of James Stannard a fracture is a soft tissue injury with a broken bone inside it. The most important determinant of outcomes is therefore the management of the soft tissue. Published evidence for the use of NPWT in open fractures is conflicting with one study showing a reduction in deep infection rate with NPWT and the other finding no difference. Although prospective RCTs are difficult to carry out in this group of traumatised patients, a recent study in fracture patients found that there was a statistically significant drop in infection rate with NPWT patients, but without collection of cultures for analysis it is not clear whether NPWT assisted in removal of bacteria or not. The idea is that rapid and appropriate use of NPWT was able to achieve closure and coverage and therefore reduce the likelihood of wound infection.
Six speakers gave presentations on-going investigator-initiated trials that are studying the full potential of NPWT and the ultra-portable single-use PICO® device in the prevention of post-surgical complications in high risk patients in orthopedic, plastic, cardiothoracic and colorectal surgery.

Sandro Giannini (Italy) reported on the growing evidence from RCTs and cohort studies to support the use of NPWT in the management of incisions in hip and knee prosthesis revision surgery. Following a review of existing literature in orthopaedic applications, an expert panel agreed that NPWT may be able to reduce the rate of wound complications when applied to the closed post-operative wound including lower extremity fracture, spinal surgery, primary arthroplasty, foot and ankle surgery and so on. The interim results reported by Giannini show that incisions treated with PICO heal faster than the control group, treated with a standard postoperative dressing and show less bruising and swelling, requiring less dressing changes. A patient grading system, such as the one being developed by Professor Stannard is needed to ensure the most appropriate patients receive NPWT.

According to Rene van der Hulst (Netherlands) post-operative complications, particularly poorly perfused flaps, are a major problem with breast reduction surgery. Published complication rates can be up to 53%, which is very high for elective surgery. Hulst described a Smith & Nephew-sponsored prospective multicentre randomised controlled study currently on-going in the USA, Europe and South Africa, on breast reduction, where patients are acting as their own controls to evaluate the efficacy of PICO compared to standard dressings (Steri-strip). Data is not yet available but Dr Hulst shared a number of cases showing improved scar formation in the first few weeks after surgery and still evident at one year follow up.

Luis Nuila (Spain) has been looking at single use NPWT to prevent surgical wound complications in surgery for implantable cardioverter defibrillators (ICD). Post-operative complications commonly include haematoma, seroma, SSI and dehiscence and the reported incidence can be up to 14%. Nuila described an on-going clinical trial comparing the PICO device to standard dressings in patients implanted with an ICD. Preliminary results suggest that the incidence of any short term complication is higher in the control group (14%) compared to the PICO group (5%). The economic impact of this type of complication is significant, with the extra costs in the control group for treating complications being three times that of the PICO group.

Reducing SSIs in Caesarian sections is important to reduce pain, immobility and delayed recovery. Sean Burns and Lindsey Bullough (UK) were concerned about a high infection rate in their institution and carried out an audit to identify problem areas. Infection was typically occurring between days 11 and 14 and was possibly connected with removal of the dressing at day 1 for inspection of the wound site. Following an evaluation of six post-operative dressings OPSITE® Post Op Visible was selected to allow post-operative inspection of the suture line without dressing removal. The use of PICO was also evaluated as a prophylactic measure in patients with high BMI. A major education programme was put in place and since the adoption of PICO the average infection rate has dropped dramatically to 2.6% compared to 12%. Feedback from patients has been very positive.

Regarding the use of NPWT in spinal surgery, Matthias Brem (Germany) reported interim results of a study including patients with spinal fracture, scheduled for open surgery. PICO dressings were used in one group and standard dressings in a second. Preliminary results suggest that the seroma formation in the PICO group was significantly less than in the standard group, at day 5 and day 10 after application. Dressing changes were much more frequent in the control group: eight in ten days with only four changes of PICO over the same period. In addition to the positive effect of NPWT on seroma prevention there was a significant reduction of nursing time and dressing material associated with its use.

In Crohn's disease, abdominal surgery to resect sections of diseased bowel are prone to a high incidence of hospital-acquired infections which prolong hospital stay and can cause long-lasting or permanent disability. Gianluca Pellino (Italy) reviewed the published evidence for the impact of NPWT on SSIs in high risk wounds and found that there was some benefit, but the devices used in most of the studies were cumbersome and expensive. A new study, carried out at the Division of General and Geriatric Surgery of the Second University of Naples (Italy) directed by Prof. Silvestro Canonico, investigated the use of PICO on primary incisions compared to conventional dressings. There was a significantly shorter LOS, no difference in major complications but less seroma formation and fewer SSIs in the PICO group. The advantage of PICO in this setting is that it allows safe discharge of patients by reducing the incidence of post-discharge SSI.
A new form of interaction

For the first time at an NPWT Expert Meeting, interaction with the audience of almost 230 healthcare professionals was managed by a Tablet System, allowing for both interactive voting and for the ability to send in detailed questions in "real time" straight to the chairs of the conference during the sessions. "This was a very impressive system, which removes some of the barriers to ask questions for attendees who are not fluent in English, and I'm sure we will be using it again" confirmed Professor Stannard.

Breakout sessions also took place on the second day of the meeting, intended to discuss how patients could be selected for incisional management in routine high risk operations - five groups were formed, looking at general/colorectal surgery, cardiovascular surgery, ob/gyn, orthopaedic surgery and plastic surgery. According to the experts attending the conference, the use of NPWT in preventing the insurgence of post-surgical complications can be considered in patients who have two or more risk factors, including active smoking, diabetes, body mass index above 30, longer surgeries (more than 5 hours), vascular disease, previous history of wound dehiscence, previous radiation or chemotheraphy, immunosuppression, and age above 70 years old.

Attendee feedback following the meeting revealed that 95% of the attendees that voted (over 50% of the 226 attendees) will consider reviewing and changing some aspects of their clinical practice, after having heard about the available evidence and after the specialty-specific discussions on patient identification and potential clinical protocol. The complete results are yet to be analysed, but will no doubt contribute to some of the excellent outputs that have emerged from these expert meetings.

References