Burns and Plastics recently published research & news: 1st Feb 2023

Northern Burn Care Network
North of England, North Wales & Isle of Man

Dear Northern Burn Network member,

In association with St Helens and Knowsley NHS Teaching Hospitals NHS Foundation Trust Library and Knowledge Service, please find attached your fortnightly burns and plastic surgery research and news update. This is a ***selection*** of the most recently published research on topics we think you will find of interest.

Professor Kayvan Shokrollahi
on behalf of the Northern Burn Operational Delivery Network, NHS England

1. Plaza, A. et al. (2023) **A six-week physical therapy exercise program delivered via home-based telerehabilitation is comparable to in-person programs for patients with burn injuries: A randomized, controlled, non-inferiority clinical pilot trial**. *Burns*: 49(1), pp. 55-67. https://doi.org/10.1016/j.burns.2022.08.014

RCT, Australia

BACKGROUND: *Exercise programmes are essential for burn rehabilitation, however patients often have barriers accessing these services. Home-based telerehabilitation (HBT) may be an alternative. This study aimed to determine if exercise programs delivered via HBT were as effective as in-person (IP) programs with respect to clinical outcomes and participant and therapist satisfaction.*

METHODS: *A single center, randomized, controlled, non-inferiority pilot trial with blinded assessment was undertaken. Forty-five adults with ≤ 25% total body surface area (TBSA) burns were randomized to receive a 6-week exercise program delivered either by HBT or IP. The primary outcome was burn-specific quality of life (Burn Specific Health Scale – Brief). Secondary outcomes included health-related quality of life, burn scar-specific outcomes, exercise self-efficacy, pain severity, muscle strength and range of motion (ROM). Participant and therapist satisfaction, technical disruptions and adverse events were also recorded.*

RESULTS: *We found no significant within- or between-group differences for any outcome measures except ROM. Achievement of full ROM was significantly different between groups at Week 12 (IP=100% vs HBT=70%, p = 0.005). Non-inferiority was inconclusive. Participant satisfaction was high (median ≥ 9.8/10), with no significant between-group differences. Therapist satisfaction was high (median ≥ 8.9/10), major technical disruptions low (8%) and no adverse events reported.*

CONCLUSION: *HBT is a safe, effective option to deliver exercise programs for patients with burn injuries ≤ 25% TBSA with comparable clinical outcomes to in-person programmes. Ongoing research is required to further analyze ROM and investigate the effectiveness of HBT for patients with larger burns.*

2. Tian, F. et al. (2023) **Silicone gel sheeting for treating keloid scars.** *The Cochrane Collaboration.* https://doi.org/10.1002/14651858.CD013878.pub2

Cochrane Systematic Review

OBJECTIVES: *To assess the effectiveness of silicone gel sheeting for the treatment of keloid scars compared with standard care or other therapies.*

MAIN RESULTS: *Two studies met the inclusion criteria. Study sample sizes were 16 and 20 participants. The trials were clinically heterogeneous with differences in causes for scarring (e.g. surgery, infected wounds, and trauma), site (e.g. chest and back), and ages of scars. The duration of follow-up was three and four and a half months. The included studies reported three comparisons; SGS compared with no treatment, SGS compared with non-silicone gel sheeting (a dressing similar to SGS but which does not contain silicone), and SGS compared with intralesional injections of triamcinolone acetonide. One trial had a split-body design and one trial had an unclear design (resulting in a mix of paired and clustered data).*

The included studies reported limited outcome data for the primary review outcome of scar severity measured by health professionals and no data were reported for severity of scar measured by patients or adverse events. For secondary outcomes some data on pain were reported, but health-related quality of life and cost-effectiveness were not reported. Both trials had suboptimal outcome reporting, thus many domains in the risk of bias were assessed as unclear. All evidence was rated as being very low-certainty, mainly due to risk of bias, indirectness, and imprecision.

AUTHORS' CONCLUSIONS: *There is currently a lack of RCT evidence about the clinical effectiveness of SGS in the treatment of keloid scars. From the two studies identified, there is insufficient evidence to demonstrate whether the use of SGS compared with no treatment, non-SGS, or intralesional injections of triamcinolone acetonide makes any difference in the treatment of keloid scars. Evidence from the included studies is of very low certainty, mainly driven by the risk of bias, indirectness, and imprecision due to small sample size. Further well-designed studies that have good reporting methodologies and address important clinical, quality of life and economic outcomes are required to reduce uncertainty around decision-making in the use of SGS to treat keloid scars.*

3. Palmieri, TL. (2023) **Emerging therapies for full-thickness skin regeneration.** *Journal of burn care & research:* 44 (Suppl 1), pp. S65–S67. https://doi.org/10.1093/jbcr/irac102

Review

The classical treatment of extensive full-thickness skin loss due to trauma or burns has been the split-thickness skin graft. While split-thickness skin grafts close the wound, they leave patients with visible scars, dry skin, pruritis, pain, pigmentation alterations, and changes in sensation. The optimal replacement for full-thickness skin loss is replacement with intact full-thickness skin. New technologies combined with advances in the understanding of the mechanisms behind wound healing have led to the development of techniques and products that may eventually recapitulate the functions, appearance, and physical properties of normal skin. Autologous homologous skin constructs, minimal functional skin units, and composite bioengineered skin with dermal substitutes all represent potential avenues for full-thickness composite skin development and application in extensive wounds. This article summarizes the progress, state, and future of full-thickness skin regeneration in burn and massive wound patients.

4. Patterson, DR. et al. (2023) **A comparison of interactive immersive virtual reality and still nature pictures as distraction-based analgesia in burn wound care.** *Burns:* 49(1), pp. 182-192. https://doi.org/10.1016/j.burns.2022.02.002

USA

PURPOSE: *Non-pharmacologic adjuncts to opioid analgesics for burn wound debridement enhance safety and cost effectiveness in care. The current study explored the feasibility of using a custom portable water-friendly immersive VR hardware during burn debridement in adults, and tested whether interactive VR would reduce pain more effectively than nature stimuli viewed in the same VR goggles.*

METHODS: *Forty-eight patients with severe burn injuries (44 adults and 4 children) had their burn injuries debrided and dressed in a wet wound care environment on Study Day 1, and 13 also participated in Study Day 2.*

INTERVENTION: *The study used a within-subject design to test two hypotheses (one hypothesis per study day) with the condition order randomized. On Study Day 1, each individual (n = 44 participants) spent 5 min of wound care in an interactive immersive VR environment designed for burn care, and 5 min looking at still nature photos and sounds of nature in the same VR goggles. On Study Day 2 (n = 12 adult participants and one adolescent from Day 1), each participant spent 5 min of burn wound care with no distraction and 5 min of wound care in VR, using a new water-friendly VR system. On both days, during a post-wound care assessment, participants rated and compared the pain they had experienced in each condition.*

Outcome measures on Study Days 1 and 2: Worst pain during burn wound care was the primary dependent variable. Secondary measures were ratings of time spent thinking about pain during wound care, pain unpleasantness, and positive affect during wound care.

RESULTS: *On Study Day 1, no significant differences in worst pain ratings during wound care were found between the computer-generated world (Mean = 71.06, SD = 26.86) vs. Nature pictures conditions (Mean = 68.19, SD = 29.26; t < 1, NS). On secondary measures, positive affect (fun) was higher, and realism was lower during computer-generated VR. No significant differences in pain unpleasantness or "presence in VR" between the two conditions were found, however. VR vs. No VR. (Study Day 2) Participants reported significantly less worst pain when distracted with adjunctive computer generated VR than during standard wound care without distraction (Mean = 54.23, SD = 26.13 vs 63.85, SD = 31.50, t(11) = 1.91, p < .05, SD = 17.38). In addition, on Study Day 2, "time spent thinking about pain during wound care" was significantly less during the VR condition, and positive affect was significantly greater during VR, compared to the No VR condition.*

CONCLUSION: *The current study is innovative in that it is the first to show the feasibility of using a custom portable water-friendly immersive VR hardware during burn debridement in adults. However, contrary to predictions, interactive VR did not reduce pain more effectively than nature stimuli viewed in the same VR goggles.*

5. Huang, J. et al. (2023) **Prospective study and validation of early warning marker discovery based on integrating multi-omics analysis in severe burn patients with sepsis.** *Burns and trauma:* 11(tkac050). https://doi.org/10.1093/burnst/tkac050

Prospective study, China

BACKGROUND: *Early detection, timely diagnosis and rapid response are essential for case management and precautions of burn-associated sepsis. However, studies on indicators for early warning and intervention have rarely been conducted. This study was performed to better understand the pathophysiological changes and targets for prevention of severe burn injuries.*
METHODS: *We conducted a multi-center, prospective multi-omics study, including genomics, microRNAomics, proteomics and single-cell transcriptomics, in 60 patients with severe burn injuries. A mouse model of severe burn injuries was also constructed to verify the early warning ability and therapeutic effects of potential markers.*
RESULTS: *Through genomic analysis, we identified seven important susceptibility genes (DNAH11, LAMA2, ABCA2, ZFAND4, CEP290, MUC20 and ENTPD1) in patients with severe burn injuries complicated with sepsis. Through plasma miRNAomics studies, we identified four miRNAs (hsa-miR-16-5p, hsa-miR-185-5p, hsa-miR-451a and hsa-miR-423-5p) that may serve as early warning markers of burn-associated sepsis. A proteomic study indicated the changes in abundance of major proteins at different time points after severe burn injury and revealed the candidate early warning markers S100A8 and SERPINA10. In addition, the proteomic analysis indicated that neutrophils play an important role in the pathogenesis of severe burn injuries, as also supported by findings from single-cell transcriptome sequencing of neutrophils. Through further studies on severely burned mice, we determined that S100A8 is also a potential early therapeutic target for severe burn injuries, beyond being an early warning indicator.*
CONCLUSIONS: *Our multi-omics study identified seven susceptibility genes, four miRNAs and two proteins as early warning markers for severe burn-associated sepsis. In severe burn-associated sepsis, the protein S100A8 has both warning and therapeutic effects.*

6. Cords, CI. et al. (2023) **Short-term and long-term increased mortality in elderly patients with burn injury: a national longitudinal cohort study.** *BMC Geriatrics:* 23(30), https://dx.doi.org/10.1186/s12877-022-03669-1

Restrospective cohort study, Netherlands

BACKGROUND: *The population of elderly patients with burn injuries is growing. Insight into long-term mortality rates of elderly after burn injury and predictors affecting outcome is limited. This study aimed to provide this information.*
METHODS: *A multicentre observational retrospective cohort study was conducted in all three Dutch burn centres. Patients aged >=65 years, admitted with burn injuries between 2009 and 2018, were included. Data were retrieved from electronic patient records and the Dutch Burn Repository R3. Mortality rates and standardized mortality ratios (SMRs) were calculated. Multivariable logistic regression was used to assess predictors for in-hospital mortality and mortality after discharge at 1 year and five-year. Survival analysis was used to assess predictors of five-year mortality.*
RESULTS: *In total, 682/771 admitted patients were discharged. One-year and five-year mortality rates were 8.1 and 23.4%. The SMRs were 1.9(95%CI 1.5-2.5) and 1.4(95%CI 1.2-1.6), respectively. The SMRs were highest in patients aged 75-80 years at 1 year (SMRs 2.7, 95%CI 1.82-3.87) and five-year in patients aged 65-74 years (SMRs 10.1, 95%CI 7.7-13.0). Independent predictors for mortality at 1 year after discharge were higher age (OR 1.1, 95%CI 1.0-1.1), severe comorbidity, (ASA-score >= 3) (OR 4.8, 95%CI 2.3-9.7), and a non-home discharge location (OR 2.0, 95%CI 1.1-3.8). The relative risk of dying up to five-year was increased by age (HR 1.1, 95%CI 1.0-1.1), severe comorbidity (HR 2.3, 95%CI 1.6-3.5), and non-home discharge location (HR 2.1, 95%CI 1.4-3.2).*
CONCLUSION: *Long-term mortality until five-year after burn injury was higher than the age and sex-matched general Dutch population, and predicted by higher age, severe comorbidity, and a non-home discharge destination. Next to pre-injury characteristics, potential long-lasting systemic consequences on biological mechanisms following burn injuries probably play a role in increased mortality. Decreased health status makes patients more prone to burn injuries, leading to early death.*

7. Dogan, S. et al (2022) **A prospective dual-centre intra-individual controlled study for the treatment of burns comparing dermis graft with split-thickness skin auto-graft**. *Scientific reports:* 12(1). https://doi.org/10.1038%2Fs41598-022-25346-4

Controlled comparison study, Sweden

To investigate if donor and recipient site morbidity (healing time and cosmesis) could be reduced by a novel, modified split-thickness skin grafting (STSG) technique using a dermal component in the STSG procedure (DG). The STSG technique has been used for 150 years in surgery with limited improvements. Its drawbacks are well known and relate to donor site morbidity and recipient site cosmetic shortcomings (especially mesh patterns, wound contracture, and scarring). The Dermal graft technique (DG) has emerged as an interesting alternative, which reduces donor site morbidity, increases graft yield, and has the potential to avoid the mesh procedure in the STSG procedure due to its elastic properties. A prospective, dual-centre, intra-individual controlled comparison study. Twenty-one patients received both an unmeshed dermis graft and a regular 1:1.5 meshed STSG. Aesthetic and scar assessments were done using The Patient and Observer Scar Assessment Scale (POSAS) and a Cutometer Dual MPA 580 on both donor and recipient sites. These were also examined histologically for remodelling and scar formation. Dermal graft

donor sites and the STSG donor sites healed in 8 and 14 days, respectively (p < 0.005). Patient-reported POSAS showed better values for colour for all three measurements, i.e., 3, 6, and 12 months, and the observers rated both vascularity and pigmentation better on these occasions (p < 0.01). At the recipient site, (n = 21) the mesh patterns were avoided as the DG covered the donor site due to its elastic properties and rendered the meshing procedure unnecessary. Scar formation was seen at the dermal donor and recipient sites after 6 months as in the standard scar healing process. The dermis graft technique, besides potentially rendering a larger graft yield, reduced donor site morbidity, as it healed faster than the standard STSG. Due to its elastic properties, the DG procedure eliminated the meshing requirement (when compared to a 1:1.5 meshed STSG). This promising outcome presented for the DG technique needs to be further explored, especially regarding the elasticity of the dermal graft and its ability to reduce mesh patterns.

8. **NEWS: BAPRAS - Abstract submission for BAPRAS' annual congress is now open**
   https://www.bapras.org.uk/media-government/news-and-views/view/abstract-submission-for-bapras-annual-congress-is-now-open!

The theme of this year's congress is 'Interface' and we are pleased to be partnering with a number of other organisations to co-organise sessions covering the breadth of plastic surgery practice. The guest programme will become available in late April. Abstract submissions are being accepted until ***midnight on 30 May***

9. **NEWS: European Burns Association - 20th European Burns Association Congress & 42e SFB Congress Abstracts submission is open**
   https://www.eba2023.org/abstract-submission/

The official abstract submission is ***open until April 15, 2023 (23:59 CET).*** *The abstracts submitted via the regular submission process will be reviewed and allocated by the international panel of reviewers and the Scientific Committee. The authors will be informed about the allocation in the second week of May.*

10. **NEWS: European Burns Association – Burn Sepsis Webinar registration now open**
    https://www.euroburn.org/education/courses/webinars-2022-2/

Wednesday 1 March 2023 at 4 PM – 6.30 PM CET
Preliminary programme:
Chairs: Luis Cabral and Nadia Depetris
16:00 Opening – Luís Cabral
16:05 What is Sepsis? – Nuno Príncipe, Intensivist (Portugal)
16:30 Burn Sepsis Clinics and Diagnosis – Athina Lavrentieva, Anesthesiologist (Greece)
16:55 Break
17:20 Sepsis Treatment – Dorothee Boehm, Plastic Surgeon and Intensivist(Germany)
17:45 PK/PD Considerations in Prescribing Antimicrobial to Burn Patients – Marisa Caetano, Pharmacist (Portugal)
18:10 Discussion
18:30 Closing – Nadia Depetris

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