

GIBSON PRIZE SESSION

BP1 DOES THE USE OF A KNOWN OBJECT IN A STATIC IMAGE IMPROVE THE ACCURACY OF BURN SIZE ESTIMATION

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Introduction: Currently information regarding burn size from referring departments to burn centres varies in accuracy. Inaccurate assessment of burn size can lead to over or under treatment especially for resuscitation burns. Photographs of injuries may improve accuracy of assessment. We aim to assess the accuracy of measuring burn size on a static image.

Method: Known areas were drawn on different body parts of the model. Using an iPhone 5s 8 megapixel camera we took photos of the marked area, and repeated with the palm, a standard bank card and a penny in the picture. Using the Du Bois formula, to get body surface area and the known marked area we calculated the percentage surface area. Members of the Burns team were asked to view the 30 photos and estimate the percentage of the marked area.

Result: There was an overall overestimation of burn size. Small areas of the forearm were better estimated and within 1.1% of the calculated surface area, however there was no improvement when using a standard object in these images. The back areas were most overestimated ranging from 0.9%-8.9% despite them all being the same sized area, this improved with objects in the image.

Conclusion: Static images tend to overestimate burn size despite the use of a standard object in the image.

Take-home message: It is difficult to assess the size of a burn using a static 2D image. Other methods should be explored to improve the accuracy of assessing burn size from a photograph.

BP2 A BURNS ALGORITHM FOR PURPURA FULMINANS MEDIATED TISSUE LOSS

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Introduction: Purpura fulminans is a severe systemic disease characterised by purpuric rash, disseminated intravascular coagulation and profound shock with devastating skin, soft tissue and limb loss. We describe our experience managing such patients, the reconstructive approaches utilised and propose a treatment algorithm that highlights the role of the burns MDT.

Method: A literature review (PubMed: keywords purpura AND fulminans) and a case series of 4 patients, including demographics, causative organisms, degree of organ failure, ICU interventions, and subsequent Burns MDT, rehabilitation and surgical interventions.

Result: Four patients (7 months to 49 years old) were included. Patients presented in severe septic shock with multi-organ failure including ARDS (n=1), AKI (n = 3), splenic infarct (n=1) and had soft tissue loss. Three patients required multiple limb amputations and all required debridement.

Subsequent reconstruction techniques included Integra®, ReCell®, SSG, FTSG, free flaps and random pattern flaps. All burns MDT members were involved from the outset. Timely consultation with rehabilitation specialists ensured early mobilisation and prosthetic limb use. Management strategies included intensive dressing changes, TPN, enteral nutrition, anti-microbial and anti-thrombotic cover, timely staged debridements, and use of TNPT. Three patients were discharged to specialist rehabilitation services. All were soon mobilising on prostheses and were closely followed up by the MDT.

Conclusion: Management of this complex patient group is challenging. Purpura fulminans often affects children so limb growth and good prosthetic wear are key. With early involvement of the burns MDT, optimal functional, psychological and cosmetic outcomes can be achieved.

Take-home message: Purpura fulminans is a severe disease that often results in devastating skin, soft tissue and limb loss. From our case series we propose a treatment algorithm that highlights the role of the burns multidisciplinary team in treatment of FP.

BP3 TOXIC SHOCK SYNDROME IN BURNS PATIENTS: AN UP-DATE ON LITERATURE AND CURRENT UK GUIDELINES.

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Introduction: Toxic shock syndrome (TSS) is a rare but potentially fatal consequence of burn injuries, particularly in children. With mortality rates of upwards of 40% if undiagnosed, prompt diagnosis and management is essential. There is relative paucity of recent evidence, highlighting the need for comprehensive review and update of current guidelines to best identify factors which affect outcome. We aim to provide evidence-based guidance to improve current standards of care.

Method: A literature review of PubMed cited articles published in the last five years was conducted (title keywords: toxic shock AND burns OR burn). The yielded 7 articles in total. Burns network

guidelines for TSS utilised across the UK were collected and reviewed.

Result: Literature review yielded important information regarding the causes, pathophysiology and management of TSS. While more frequently reported in children, adult cases of TSS are described. Total body surface areas under 5% have been implicated. The evidence for prophylactic antibiotics is weak. There is no concrete evidence linking TSS to specific wound management. We found a lack of standardised, evidence-based approaches to TSS recognition and treatment amongst burns services.

Conclusion: TSS is a life-threatening complication of burn injury, particularly in children. Patients and their families should be aware at initial presentation of the signs and symptoms which require urgent assessment. Early diagnosis improves outcomes and can significantly reduce the associated morbidity. We have produced up-to-date multidisciplinary guidance which we hope to present to our professional body in order to allow national implementation.

Take-home message: Toxic Shock Syndrome is a rare but potentially fatal condition that must be recognised promptly. An evidence-based guideline for all burns services could improve current standards of care.

BP4 THE IMPACT OF MAJOR TRAUMA CENTRE ESTABLISHMENT ON BURN PATIENT OUTCOMES

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Introduction: Patients presenting with burn injuries benefit from specifically trained multidisciplinary teams. Regional trauma systems have shown improved outcomes for trauma patients. The aim of this study is to determine whether the development of major trauma systems have improved the management of patients with major burns.

Method: A retrospective study was performed over a four-year period reviewing all major burns in adults and children received at a regional burns centre in the UK before and after the implementation of the major trauma centres (MTC). Comparisons were made between: 1. Patients presenting before and after the introduction of MTC. 2. Patients referred from MTC and non-MTC following the introduction of MTC. 3. Patients referred using an urban trauma protocol and the rural trauma protocol.

Result: Following the introduction of MTC, burn patients seen at our regional burns centre did not show any significant improvement in transfer times, physiological parameters or survival when referred from a MTC compared to a non-MTC, however there was a significantly longer distance travelled ($P= 0.029$). There was also no significant difference in survival when comparing referrals from all hospitals pre and post establishment of MTCs.

Conclusion: No significant outcome benefit was demonstrated for burns patients referred via MTCs compared to non-MTCs, although those from MTC travelled greater distances. Further research is needed to ascertain whether burns patients benefit from prolonged transfer times to a MTC compared to those seen at their local hospitals prior to transfer to a regional burns unit.

Take-home message: No significant outcome benefit was demonstrated for burns patients referred from major trauma centres compared to non major trauma centres, although those from major trauma centres travelled greater distances.

BP5 A SYSTEMATIC REVIEW OF OBJECTIVE BURN SCAR MEASUREMENTS

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Introduction: With emerging new therapies for the treatment of scars, the comparative success of these different treatments should need to be evaluated objectively in order to minimise bias and subjectiveness. However, the clinical assessment of scars is not currently carried out systematically and is mostly based on subjective scores. The aim of this review is to evaluate various objective measurement tools currently available and to recommend a useful panel that is suitable for use in clinical trials of anti-scarring therapies.

Method: A systematic literature search was done using the Web of Science, PubMed and Cochrane databases. The identified devices were then classified and grouped according to the parameters they measured. The tools were then compared and assessed in terms of inter- and intra-rater reproducibility, ease of use and cost.

Result: After duplicates were removed, 5062 articles were obtained in the search. After further screening, 157 articles which utilised objective burn scar measurement systems or tools were obtained. The scar measurement devices can be broadly classified into those measuring colour, metric variables, texture, biomechanical properties and pathophysiological disturbances.

Conclusion: Studies that evaluate the reliability and performance of objective scar measurement tools are scarce, and there remain factors, such as itch and pain, which cannot be measured

objectively. On reviewing the available evidence, a panel of devices for objective scar measurement is recommended consisting of the 3D cameras for surface area and volume, colorimeters for colour, high-frequency ultrasound for scar thickness and suction based probes for skin elasticity and pliability.

Take-home message: The audience will be introduced to the different categories of objective scar measurement tools and the relative advantages and limitations of the tools and will be better informed to choose the most suitable tools to suit their clinical needs.

BP6 HOW TO CHANGE A WHOLE BODY DRESSING IN 30 MINUTES - TECHNICAL TIPS AND A SYSTEMATIC REVIEW OF THE LITERATURE

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Introduction: Several conditions can result in injury to large surface areas of skin, including burns, autoimmune blistering mucocutaneous diseases, major trauma and necrotising soft tissue infections. They are often treated in burns units to manage the underlying pathologies and frequently change whole body dressings. The purpose of dressings is to facilitate wound healing by maintaining a clean, moist and warm environment. Whole body dressings can be challenging, costly and time consuming. Prolonged exposure of wounds will result in loss of temperature, increased risk of infection, dehydration and poor wound healing.

Method: A systematic literature search identified resources, dressings and techniques currently used for whole body change of dressings. Here we describe our experience of how to change a whole body dressing within thirty minutes.

Result: Dressing selection is critical for promoting wound healing and will depend on the wound bed. The aim of dressings is to promote moisture balance. Dressings for necrotic tissues aim to debride eschar; sloughy tissues require de-slough and a healthy bed for granulation; granulating wounds require an environment to promote epithelialisation; epithelialising wounds require maturation; over-granulating wounds require re-balance to healthy granulation; and colonised or infected wounds require a reduction of bacterial burden and to manage symptoms such as malodour and exudate.

Conclusion: Large areas of skin loss provide challenges for plastic surgeons, including the need for frequent whole body change of dressings. We present a systematic and reproducible method for whole body dressings aimed at reducing the time, resources and cost of this challenging routine.

Take-home message: Different wounds have different dressing requirements. Change of whole body dressings can be quick and achievable with limited resources and personnel.

BP7 THE PSYCHOLOGICAL BURDEN OF MAJOR BURN INJURIES

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Introduction: Burn injuries are a debilitating cause of morbidity and mortality. With advances in specialised wound care and reconstructive surgical techniques, survival rates have markedly improved. Mental health is a large factor in long-term quality of life; the objective of the study was to characterise their psychological symptoms.

Method: Data was gathered from patients admitted to intensive care with severe burns (>15% total body surface area). Exclusion criteria comprised head trauma, toxic epidermal necrolysis syndrome, psychological problems that may be exacerbated by inclusion and substance misuse. Patients were matched with volunteers controlled for age and sex. Subjects underwent formal face-to-face psychological assessment using Beck Anxiety Inventory (BAI); Beck Depression Index II (BDI-II); General Anxiety Disorder 7 (GAD-7); Patient Health Questionnaire 9 (PHQ-9) and the Trauma Screening Questionnaire (TSQ) and analysed using the Mann-Whitney U test.

Result: Psychometric testing of 15 patients (mean age 40.9; 11 male, 4 female; median time after injury 2.68 years, IQR 2.05-4.56) and 15 controls (mean age 39.9) revealed higher depressive (BDI-II $p < 0.05$, PHQ-9 $p < 0.05$) and post-traumatic stress symptoms (TSQ $p < 0.05$) in the burn group. Common symptom themes included: agitation/irritation, fear, sleep disturbance and worthlessness.

Conclusion: This study demonstrates that burn survivors have an increased vulnerability to depression and post-traumatic stress symptoms. Some psychological symptoms are common burn symptoms resulting in potential false positives. It reinforces the importance of utilising validated screening instruments to assess their psychological health after discharge. Further research is needed to characterise burn-induced psychological symptoms.

Take-home message: This study demonstrates that burn survivors have an increased vulnerability to depression and post-traumatic stress symptoms. It reinforces the importance of utilising validated screening instruments to assess their psychological health after discharge.

JACKSON'S PRIZE SESSION

BP8 IMPLEMENTING ROUTINE USE OF AN ENZYMATIC DEBRIDEMENT SYSTEM AT A REGIONAL BURNS SERVICE

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Introduction: Nexobrid® is an enzymatic debridement tool for deep partial and full thickness burns. Level 1 evidence has shown Nexobrid® to reduce the need for surgery and improves aesthetic outcome compared to current standard of care. The departmental implementation of Nexobrid® in a regional burns unit is described. We present the service set-up and initial early results.

Method: Step-wise presentation of our service set-up for enzymatic debridement: • review of current safety and efficacy evidence • costing analysis • gaining formulary approval • safety and training for all users • departmental visits to a centre of excellence • Information gathering continued monitoring

Result: Formulary approval processes are described and the trust were satisfied this was a cost-effective strategy equating to reduction in length of stay and theatre time. All members of our nursing and medical team have been trained in the treatment protocol. Two groups have had centre of excellence training. To date, 9 patients have been treated with this approach. One required secondary surgical debridement and grafting. One avoided escharotomies for a full thickness hand burn. All had satisfactory healing times (mean 21 days) and pain scores. There have been no infective complications or requirement of blood products.

Conclusion: We demonstrate the use of a streamlined, standardised pathway for use of Nexobrid® in a regional burns unit. Comprehensive protocols allow for timely identification of appropriate patients resulting in good clinical outcomes. Further data will be presented at regular intervals. We propose multi-centre pooling of data for this novel treatment strategy.

Take-home message: Nexobrid® is an enzymatic debridement tool for deep partial thickness and full thickness burns. We describe the departmental implementation and process of service set-up at a regional burns unit for routine Nexobrid® debridement.

BP9 IS THROMBOCYTOPENIA A MARKER FOR SEPSIS AND MORTALITY IN SEVERE BURNS?

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Introduction: Previous studies have shown a distinctive pattern of thrombocyte counts post-burn injury and that a reduced peak is associated with mortality. This study aims to identify if this pattern is also associated with sepsis. Secondly, it aims to identify if other haematological variables can be useful predictors of patient outcomes. The primary outcome is in-hospital mortality. Secondary outcomes include the incidence of sepsis, total length of stay, and length of stay in intensive care.

Method: This is a retrospective cohort study. The cohort was identified from electronic patient records from January 2007 to May 2015. Only those with a TBSA greater than 20% were included. Paper notes were reviewed for all participants.

Result: 145 patients were included in the analysis. Among the cohort median TBSA was 30% (IQR 25.8) there was a survival rate of 75.2% and 60 (41.4%) patients developed sepsis. Results show that there is a significant difference between thrombocyte counts in patients stratified for sepsis and survival. For both outcomes, the nadir at day 3-5 and peak at days 12-19 are reduced significantly. The length of stay in the intensive care unit is significantly prolonged in those patients with a reduced nadir and peak. Haematological variables that also show significantly different results when stratified for survival and sepsis are serum albumin, haematocrit and the platelet-lymphocyte ratio (PLR).

Conclusion: Thrombocytopenia at 3-5 days and a reduced thrombocytosis at 12-19 days post-burn injury could be predictive of sepsis and 50 day in-hospital mortality. TBSA=Total Body Surface Area

Take-home message: Thrombocyte patterns post-burn injury could be predictive of sepsis and 50 day in-hospital mortality. Other haematological variables may also play a role.

BP10 IMPROVED OUTCOMES FOR TOXIC EPIDERMAL NECROLYSIS MANAGED AT A

REGIONAL BURNS CENTRE

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Introduction: Toxic epidermal necrolysis (TENs) is a rare potentially fatal disorder characterised by large areas (>30% TBSA) skin desquamation. TENs patients are often managed in burns centres for expert wound management and comprehensive multidisciplinary care. We report clinical outcomes of TENs patients managed by a regional burns centre over an 11-year period to appraise outcomes and assess local performance against international comparators.

Method: A retrospective review was performed for all patients with a clinical diagnosis of TENs or TENs-Stevens-Johnson Syndrome (TENs-SJS) admitted to our burns centre during June 2004-June 2015. Patient demographics, extent of necrolysis (TBSA), mucosal involvement, causation, severity of illness score (SCORTEN), length of stay and survival were recorded. Comparisons were made with published studies.

Result: During the study period, 41 patients (M: 53%; F: 46.3%) with TENs (n=32) and TENs-SJS Overlap (n=9) were managed within our burns service. Median TBSA of cutaneous involvement was 65% (R: 10-100%) and median length of stay was 15 days (Range: 1-144 days). Observed vs. expected mortality according to SCORTEN score is presented in Figure 1 with a summative standardised mortality ratio of 0.25. Improved survival rates were seen compared to current literature.

Conclusion: Managing TENs patients within a regional burns centre improves survival irrespective of severity. Early referral, aggressive Versajet debridement supplemented by silver-based dressings +/- physiological closure (in line with UK guidelines) optimises patient outcomes and facilitates high-level survival when compared with international comparators.

Take-home message: Managing TENs patients within a regional burns centre improves survival irrespective of severity.

BP11 ACCURACY OF STANDARD METHODS USED TO ESTIMATE BURN SIZE COMPARED TO DIFFERENT SMARTPHONE APPLICATIONS.

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Introduction: Accurate estimation of burn size is essential to ensure appropriate treatment is given to the patient especially with respect to resuscitations burns. Under estimation can lead to delayed treatment and overestimation can lead to unnecessary fluid resuscitation.

Method: We drew a known area onto the back of a model to represent a burn injury, then using the Du Bois formula we calculated this as a percentage of the total body surface area. We then transferred this onto a Lund and Browder Chart and a rule of nines chart and estimated the burn surface area using these standard methods. Next we used the Mersey Burns application and BurnCase3D application, and drew out the same area to see what percentage these methods gave us.

Result: We found that the 2D images used on the paper charts and the 2D Mersey Burns app all overestimated burn size when compared to the calculated one from the DuBois formula. The 3D model used in the BurnCase 3D app gave a much more accurate percentage.

Conclusion: There was an overestimation of burn size on all 2D methods, which may be attributed to the fact that none of these methods include the flanks of the body. We propose an adaptation of the Lund and Browder chart to include a side view of the images where flanks of the body are also given a percentage surface area.

Take-home message:

Current 2D methods of estimating burn size need to be improved, as flanks of the body are not included which results in an overestimation of percentage burn size.

BP12 A PROSPECTIVE STUDY COMPARING FLIR ONE WITH LASER DOPPLER IMAGING IN THE ASSESSMENT OF BURN DEPTH BY A LARGE TERTIARY BURNS UNIT IN THE UNITED KINGDOM

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Introduction: Thermal imaging may have a potential role in burn depth assessment. Current prototypes have limited clinical use. FLIR One is a miniature thermal imaging camera; mountable to a smartphone and ready to use with the corresponding mobile application. Although the detection of temperature range is narrower and the images produced have lower resolution in comparison to the

larger more expensive thermal imaging cameras, it is a cheaper alternative. This study aims to assess the practicality of FLIR One for its clinical application and to compare against Laser Doppler Imaging (LDI) in the burn depth assessment.

Method: 30 burn wounds of total body surface area (TBSA) less than 10% presenting within 72 hours of injury were included for assessment. Patients were divided into groups according to wound healing potential of a) less than 14 days, b) between 14 and 21 days and c) above 21 days. We correlated healing potential prediction of FLIR One against the LDI. This study has been approved by the ethics committee.

Result: The incorporation of FLIR One into service provision was easy. However, there was a learning curve for the interpretation of images. Subjective evaluation using colour coded temperature scale did not always clearly corresponded with healing potential groups. We found that the accuracy of FLIR One was comparable to LDI.

Conclusion: FLIR One signifies the beginning of wide availability of 'real-time' thermal imaging. Our experience with the device was positive. However, more research into the influence on environmental factors on its accuracy is required.

Take-home message:

Our experience with the device was positive: we found that the accuracy of FLIR One was comparable to LDI. However, more research into the influence on environmental factors on its accuracy is required.

BP13 OUTCOME MEASURES REPORTED IN PUBLISHED CLINICAL RESEARCH STUDIES OF INTERVENTIONS FOR PATIENTS WITH CRANIOSYNOSTOSIS: A SYSTEMATIC REVIEW

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Introduction: Craniosynostosis is the premature fusion of the bones of the skull in children. The literature is expected to be prone to the use of variable outcomes and reporting bias. This impairs the comparison of treatments across different studies, but has not previously been assessed.

Method: A Cochrane and PRISMA-compliant systematic review was performed following a registered protocol. Studies were sourced via a search of PubMed, Cochrane, AMED, EMBASE, WHO Trials Registry and Clinicaltrials.gov. All primary, interventional studies for craniosynostosis published in the previous five years (2011-2015) were reviewed. The individual outcomes reported, whether the outcomes were defined and whether the outcomes were pre-specified in the methods, were all recorded.

Result: Of 1027 studies screened, 240 were included and proceeded to data extraction. These studies included 18,365 patients. 2190 separate outcomes were reported. Of these, 852 outcomes (38.9%) were clearly defined, 1392 (63.6%) were pre-specified in the methods, and 800 outcomes (36.5%) were both defined and pre-specified. Clinical and functional; was the most commonly reported outcome theme (891 outcomes, 41.0%), and Patient-reported outcomes the least (6 outcomes, 0.3%). Duration of surgery was the most commonly reported single outcome (reported 80 times). Cranial index was the most variably defined outcome (17 different definitions used).

Conclusion : The outcomes reported following treatment interventions for craniosynostosis are incompletely and variably defined. Improving definitions for these outcomes may aid comparison of different management strategies, and improve craniosynostosis care. Sub-optimal pre-specification of these outcomes in the study methods implied that outcome reporting bias cannot be excluded.

Take-home message:

The outcomes reported following treatment interventions for craniosynostosis are incompletely and variably defined.