Treatment before transfer: the patient with burns

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Abstract

Objectives—To review pre-burns centre management, including assessment, resuscitation, and transfer.

Methods—A retrospective analysis of the notes of all the UK patients admitted to the Burns Centre in 1998, who had a body surface area burn of over 15% in adults (10% in children).

Results—There were 31 patients, 21 adults and 10 children, and the average burn size was 32% (12–96%). Fourteen were overestimated (average of 9%) and 13 underestimated by 7.5%. Twenty nine received intravenous fluids, 18 specified a formula, but it was only applied correctly in 10. The average time to the Burns Centre from the burn was 10 hours, and the time for resuscitation and transfer, eight hours. Documentation was generally poor.

Conclusion—There has previously been considerable variation in the standard of initial burn management and there have been problems with burn percentage assessment and resuscitation formula application. A new proforma has been introduced to tackle these issues.

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It is well known that the early aggressive management of major burns improves survival.^{1–3} Immediate burn care involves airway management and fluid resuscitation, the most important period being the first few hours after the burn injury. Appropriate early management by the on scene retrieval team and the receiving accident and emergency department is therefore essential.

In October 1997 the hospital policy for fluid resuscitation of major burns was changed to use crystalloid rather than colloid solutions as the main initial intravenous fluid. This change of policy was circulated to all hospitals in the Burns Centre catchment area.

The purpose of this study was to review the pre-burns centre management of a 12 month cohort of patients, who had been treated after this policy change.

The four main areas of interest were; percentage assessment of the burn, adequacy of fluid resuscitation and analgesia, the timing of transfer, and transfer documentation.

Methods

A retrospective analysis was performed of all patients admitted to the McIndoe Burns Centre at The Queen Victoria Hospital, East Grinstead during 1998. Patients with more than 15% burns in adults and 10% burns in

children were included as these patients are generally accepted to require intravenous fluid resuscitation, and their notes were reviewed. Exclusions were international transfers and non-acute admissions, as these patients were not being transferred during the resuscitation phase and had often had their primary management at other burns facilities. This Burns Centre accepts adult and paediatric burns from a 3.5 million person catchment area, including all varieties of major burn and is able to ventilate patients over 5 years.

At the Burns Centre, burn percentage is assessed using an appropriate Lund Browder chart.⁴ Comparison was made between the referred percentage burn and that calculated by the burns team.

Documentation from the referring hospital was reviewed for evidence of fluid resuscitation formulas, such as Parkland or Muir Barclay/Mount Vernon.^{5,6} In addition we noted details of fluids and analgesia given, and timing of transfer.

Results

Altogether 31 patients fulfilled the criteria, of whom 19 were male and 12 female. There were 21 adults and 10 children, average adult age 50 years (21–94 years) and average child 4 years (11 months–14 years). The aetiologies of the burns are shown in table 1. Thirteen of the 31 patients died and within this group there were three deaths of elderly patients with scalds of 25% or less. On average there were 1.5 referrals per hospital.

In our study the average body surface area (BSA) burn was 32% (12–96%). When compared with the referred percentage 14 patients were overestimated by an average of 9% (2–19%) and 13 patients were underestimated by an average of 7.5% (0.5–23%). The underestimated group included a scald assessed as 5%, which was actually 23% and a flame burn assessed as 50%, which was actually 73%. These percentage differences were analysed using a paired *t* test and this showed no statistical difference between the Burns Centre assessment and the accident and emergency assessment (*p*=0.6).

The results of our study showed that 25 patients (80%) were resuscitated with crystalloid, four (13%) with colloid and two patients did not receive intravenous fluids.

Table 1 Aetiology of the burn

Aetiology	Adults	Children
Flame	12	2
Flash	2	
Scald	5	8
Contact	1	
Other	1	

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Ten patients (31%) were appropriately resuscitated by either the Muir Barclay formula with colloid or the Parkland formula with Hartmann's solution.

Of the remaining patients, seven (22%) were resuscitated using the Muir Barclay formula but with Hartmann's solution, and six (19%) using the Parkland formula with other crystalloids. In six patients (19%) no details of a formula were given.

Catheterisation was carried out in 19 patients (61%), but in only half of these was any documentation of urine output given, and less than half of all the patients had a fluid balance chart.

Twenty eight patients (90%) received opioids, 20 (65%) of which were given by the intravenous route.

Four patients underwent escharotomy (two chest, two extremities) but this was revised on arrival in one patient.

The time between the burn injury and reaching a burns centre was on average 10 hours (range 40 minutes–66 hours). Most of this time (average eight hours, range 1.5–65 hours) was either spent in the local hospital or on route to the burns centre, as on average the burns patients reached the local hospital 2.5 hours (5 minutes–48 hours) after injury.

In 16 patients (52%) the only documentation was photocopies of A&E notes and in 15 (48%) there was a burn proforma (usually incomplete) or a transfer letter.

Discussion

Burns injuries generate an inflammatory response to the injured tissue proportional to the burn surface area. Larger burns (more than 15% BSA burn in adults and 10% BSA burn in children) require intravenous fluid resuscitation to treat hypovolaemia secondary to increased capillary permeability. Recognition of the time limited nature of the changes in capillary permeability led to the development of fluid resuscitation formulas to provide a template from which individual fluid requirements could be adjusted. Plasma protein loss into the extra cellular space dictates colloid fluid replacement at some point in the resuscitation regimen—debate continues as to the nature and timing of an optimal fluid regimen. The theoretical advantage of early colloid administration is a reduction in interstitial oedema in the unburned portion of the patient but increasing concerns regarding the cost and safety of colloid solutions, particularly albumin have resulted in many centres including our own adopting an early fluid resuscitation policy based solely on crystalloid solutions.

Overestimation of %BSA burn is often attributable to the incorrect inclusion of erythema, which can be difficult to distinguish initially. By the time the patient arrives at the burns centre the situation may have become clearer as some erythema resolves. The over transfusion of fluid as a result of this over estimation can cause problems especially in the elderly patient.

Of equal concern is the group of patients where %BSA burn was underestimated, and

who therefore received inadequate resuscitation. Although the differences in %BSA burn assessment were not statistically significant in this small group, the clinical significance for the individual patient initially assessed at 5% and later found to be 23% was considerable, and highlights the need for a formal burns centre assessment of patients who are believed by the referring hospital to have sustained less serious burns.

There is still much discussion regarding the optimal burn resuscitation fluid and there is regional variation between burns centres (BAPS meeting, Belfast, 1999). However, it is important that the appropriate formula is used for the fluid selected.

In the first four hours the Muir Barclay formula delivers half as much volume as the Parkland formula and therefore the seven patients who were resuscitated using the Muir Barclay formula with Hartmann's solution, were substantially under transfused.

The adequacy of resuscitation is judged by the general condition of the patient and information such as urine output is vital. The lack of fluid balance charts and in some cases catheters made tailoring of fluid resuscitation difficult on arrival.

Rapid effective analgesia is provided by intravenous opioids whereas other routes such as oral or intramuscular administration can result in poor absorption because of changes in blood flow.

As there is the considerable time gap between the burn injury and reaching a burns centre it is vital that the definitive resuscitation plan is started quickly and continued during the transfer.

Escharotomy should be considered and performed if necessary, but is often inadequate in inexperienced hands so delaying transfer may be unjustified.⁷

Although the management of these often life threatening injuries may be of an acceptable standard the documentation available at the burns centre was very poor.

Particular areas of concern were legibility of photocopied notes and detail as to who assessed or transferred the patient.

Most A&E department staff see major burns infrequently and may lack experience in their management. After this study we designed a new proforma to be an aide memoir as well as a transfer document. It incorporates ATLS methodology,⁸ concentrates on accuracy and accountability, and details the Parkland formula.

On receipt of a phoned referral the plastic surgery senior house officer invites the A&E department doctor to complete the proforma and fax it to the burns centre. The plastic surgeon and anaesthetist then review the information and give any necessary advice. %BSA burn estimation is difficult even for experienced staff, however non-burns staff are far more accurate at drawing the burn than calculating the actual percentage.⁹ The faxed Lund Browder chart (part of the new proforma) allows the burns team to check this important calculation. After all necessary treatment has

been started; the transfer of the patient is arranged.

In conclusion, significant improvements can be made in the pre-burns centre management of the burns patient. There seems to be confusion with fluids and formulas, and %BSA burn assessment is inaccurate. The new proforma aims to overcome these problems (see the journal's website emjonline.com for a copy of the proforma).

Contributors

Helen Ashworth participated in reviewing the patient notes, collecting data, analysing the results, designing the new proforma and writing the paper. Tania Cubison participated in reviewing the patient notes, collecting data, analysing the results, designing the new proforma then writing and revising the paper. Philip Gilbert initiated the research, discussed the design for the new proforma, and edited the paper. Ken Sim initiated the research, contributed to the design of the new

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