Introduction

Burn injury remains one of the time-sensitive injuries and illnesses which substantially challenge healthcare professionals around the world. According to the American Burn Association (ABA), there are approximately 450,000 burn injuries each year in the United States (US). Given that the US represents approximately 5% of the world population, a conservative extrapolation would suggest that annually, there are 10,000,000 burns worldwide. This approximation is close to the figure reported by the World Health Organization (WHO) in 2004, where “nearly 11 million people worldwide required medical attention for a burn injury,” according to the most recent data available on a 2012 fact sheet from the WHO.

It is reasonable to presume clinicians have a basic understanding of burn care and how to assess and describe the different severity of burn injuries for pediatric and adult patients. However, several years of anecdotal experiences by the authors suggested a lack of consensus when discussing even the most basic elements of burn care; the labels used to stratify the different levels of injury acuity. This inconsistent use of descriptive terms and phrases can also impact public education and burn prevention programs as well as those programs used to target specific burn care providers such as Advanced Burn Life Support (ABLS) and Emergency Management of Severe Burns (EMSB).

During the past several years of reviewing more than a thousand articles related to burn injury, traumatic injury or disaster medicine, it was apparent that there is an ongoing inconsistent use of terms and phrases to describe the varying types of burn injury. It is difficult to evaluate academic papers or develop educational programs when there are multiple terms and phrases used to identify the same injury.

The aim of this work began with identifying the most prevalent terms or phrases used to label a burn injury in a general search of internet based references. Then using those results to conduct a more focused search of the PubMed database to identify how often those most commonly used terms/phrases were the labels of choice. Although much of what is found through typical search engines lacks the rigor of academic peer reviewed efforts, it was a reasonable source to help bring into focus and narrow the search. Furthermore, it serves as a reminder of the significant inconsistency throughout the general population, even when describing the most basic types of burn injury.
Methods

A preliminary search was conducted by entering the phrase “burn injury” into the Google search engine, which yielded “about 8,600,000” results. Each of the 100 highest rated hits was further categorized with the focus on narrowing the search for use in PubMed. Based on the Google search results, there were 11 terms or phrases identified in the 100 highest rated hits. In no particular order, the findings identified included: First (1°) Degree Burn, Second (2°) Degree Burn, Third (3°) Degree Burn, Fourth (4°) Degree Burn, Fifth (5°) Degree Burn, Sixth (6°) Degree Burn, Superficial Burn, Partial Thickness Burn, Deep Partial Thickness Burn, Full Thickness Burn, and Severe Burn Injury. Each of these 11 terms/phrases were then used with the exact match function in PubMed, searching either the title or the abstract for hits using one or more of these 11 terms/phrases. The start date was the most recent published as of November 1, 2012, and the last article included in the search was published on or after January 1, 2000. All earlier references were not included and those results were not evaluated or recorded for this work.

The search parameters included an exact phrase either located in the title or the abstract and all other fields were not included in the search. After each of the 11 searches was conducted, the findings were evaluated to determine if there were other questions created by the manner in which the search was conducted. After each search, the findings were recorded and the process ended after the 11 searches.

Results

The common internet search engine data produced eleven (11) terms/phrases that were used to describe a burn injury in the context of stratifying the severity of the burn injury. A total of 1,110 academic papers in the PubMed search reflected one or more of the 11 terms/phrases identified through the common internet search. All of the 1,110 papers identified for inclusion based on the search criteria, focused primarily on one specific burn injury and included one or more of the terms/phrases. Where more than one of the target terms/phrases was identified in the search, the paper was further reviewed to determine if the focus of the work included more than one of the burn injuries identified. There were 9/11 (81.8%) of the terms/phrases identified using the common internet search engine which were also found in the PubMed search. There were 2/11 (18.2%) terms/phrases identified in the common internet search engine that were not identified in the PubMed search. Those not found in the PubMed search included the Fifth (5°) Degree Burn and the Sixth (6°) Degree Burn.

Given that the Superficial Burn and the First (1°) Degree Burn describe basically the same injury, they were compared in use. A total of 55 papers were identified that met inclusion criteria and of which Superficial Burn represented 40/55 (72.7%) while First (1°) Degree Burn represented 10/55 (27.3%) (Fig. 1). The same comparison was made involving the Partial Thickness Burn and the Second (2°) Degree Burn. A total of 472 papers were identified that met inclusion criteria of which 320/472 (67.8%) were identified as Partial Thickness Burn and 152/472 (32.3%) were identified as a Second (2°) Degree Burn (Fig. 2). The Full Thickness Burn was compared to the Third (3°) Degree Burn. A total of 472 papers were identified that met inclusion criteria of which 320/472 (67.8%) used the term/phrase Full Thickness Burn compared to 152/472 (32.3%) using the term/phrase Third (3°) Degree Burn (Fig. 3). Use of the term Fourth (4°) degree burn injury was also found in 7 seven academic papers, where this was described as being a Full Thickness Burn that extended beyond the hypodermis into the muscle tissue or muscle and bone. There were no papers that matched either Fifth (5°) or Sixth (6°) Degree Burn in the search results. There were, however, 76 academic papers that discussed a Deep Partial Thickness Burn. As one would presume, the injury described in the 76 papers generally shared characteristics of the Partial Thickness Burn and the Full Thickness Burn.

A common phrase also used was the Severe Burn Injury (SBI). The phrase was identified in 229 academic papers published after January 1, 2000. All of the papers reviewed used SBI as a general category to describe the
Partial Thickness Burn, Full Thickness Burn and Deep Partial Thickness Burn. There were no incongruent findings. Specifically, at no point did the researchers find that Superficial Burn was used to describe a Second (2nd) Degree Burn or a Third (3rd) Degree Burn. Furthermore, at no point was a Partial Thickness Burn used to describe a First (1st) Degree Burn or a Third (3rd) Degree Burn. Finally, the Full Thickness Burn was not used to describe a First (1st) Degree Burn or a Second (2nd) Degree Burn.

Discussion

Logic suggests, for the sake of consistency in a given profession, it is important to use one common set of terms to describe these critical aspects of a burn injury.7 Also, injury to one or more of the three layers of skin is generally the focal point of the evaluation during the burn injury assessment.8 As such, further stratification for burn injury that extends beyond the hypodermis into muscle tissue necessary? How about burn injury that involves bone or muscle tissue beyond the three layers of skin?

If the only point of contention was whether to use the term “First (1st) Degree Burn” or “Superficial Burn,” the findings suggest those arguments are settled for a clear majority in the scientific community publishing their work in peer reviewed journals. However, the bigger issue concerns the number of papers that described the Deep Partial Thickness Burn. If the answer remains that there are three layers of skin and thus there are three levels of burn injury, what becomes of this label? Since the initial assessment and care of the Deep Partial Thickness Burn is

<table>
<thead>
<tr>
<th>Question</th>
<th>Partial Thickness vs. 2nd Degree</th>
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<tbody>
<tr>
<td>Term Used</td>
<td>Observed %</td>
</tr>
<tr>
<td>Partial Thickness</td>
<td>66.42%</td>
</tr>
<tr>
<td>2nd Degree Burn</td>
<td>33.58%</td>
</tr>
<tr>
<td>Total</td>
<td>271</td>
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</tbody>
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Chi Square | 6.43E-08 |
Degrees of Freedom | 2 |
P value | <0.001 |
Results are Statistically Significant.

Fig. 2 - Findings for the use of “Partial Thickness Burn” when compared to “Second (2nd) Degree Burn” as a description in Peer Reviewed Articles.

<table>
<thead>
<tr>
<th>Question</th>
<th>Full Thickness vs. 3rd Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term Used</td>
<td>Observed %</td>
</tr>
<tr>
<td>Full Thickness</td>
<td>67.80%</td>
</tr>
<tr>
<td>3rd Degree Burn</td>
<td>32.20%</td>
</tr>
<tr>
<td>Total</td>
<td>472</td>
</tr>
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Chi Square | 1.05E-14 |
Degrees of Freedom | 2 |
P value | <0.001 |
Results are Statistically Significant.

Fig. 3 - Findings for the use of “Full Thickness Burn” when compared to “Third (3rd) Degree Burn” as a description in Peer Reviewed Articles.

Fig. 4 - Burn Injury assessment to reflect TBSA inclusion/exclusion criteria. This also includes where Deep Partial Thickness Burn should be assessed and managed. Partial, Deep Partial and Full Thickness burns smaller than 10% TBSA, may be classified as a MBI but should be assessed before reaching that conclusion. Location of Assessment will vary based on resource availability. Burn and Trauma Centers are not routinely available worldwide.
approximately the same as the Full Thickness Burn and, moreover, is also the same as that for the Fourth (4°) Degree Burn as identified in the common search, it is logical that all should fall under the Full Thickness Burn classification for the initial assessment and treatment.

In the US, there is a trend to associate descending numbers with one being either the best service or serving the most critical conditions, such as Level I Trauma Center7 or a Type I National Incident Management System (NIMS) resource.4,12 To follow that logic alone would suggest abandoning the historical use of 1°, 2° and 3° degree burns is a reasonable evolution since it runs counterintuitive to what is currently in use in the medical and disaster profession. Nevertheless, that may be more applicable to the US and offer less value to the greater international perspective.

Conclusions and recommendations

A review of the literature indicates a clear preference to use descriptive terminology rather than degrees of injury. Generally, this transition from degrees of injury to descriptive terms has been taking place in the literature for the past 12+ years, and today the more favored terms include Superficial, Partial Thickness and Full Thickness as the three main descriptions of burn injury.

Our findings reveal a clear majority of academics who publish their research using mainly descriptive terms to label the different stratifications of burn injury: Superficial Burn, Partial Thickness Burn and Full Thickness Burn in lieu of First (1°), Second (2°) and Third (3°) Degree Burns. Given the limited use of a Fourth (4°) Degree Burn and the absence of peer reviewed published works referring to a Fifth (5°) and Sixth (6°) Degree Burn, the clear majority are using descriptive terms to label a burn injury and use of anything beyond a Full Thickness Burn is either rare or non-existent.

The finding for the prevalence of the use of Deep Partial Thickness Burn is somewhat of a paradox. Given there were 76 published papers using this label, it clearly has relevance to those publishing their work. However, a common theme in many of these academic papers included the depth and degree of injury as well as the extent of care needed to manage this patient. Maybe the best place to suggest the use of this label is in the context of assessment and care confined within a Burn Center or where specialized burn care is provided.

It is the conclusion and recommendation of these authors to adopt and encourage colleagues to focus on a common language to describe the initial burn injury assessment. For initial assessment and care that begins in the pre-hospital setting, and continues at the community hospital level, the labels Superficial, Partial Thickness and Full Thickness should be the standard nomenclature. It is further recommended that the Superficial Burn be left in a category of its own, such as a Minor Burn Injury (MBI), as another way to remind clinicians to exclude the impact of the MBI when calculating the TBSA. Those burn injuries that are included in the rule of nines calculation, that is the Partial Thickness and Full Thickness Burn, would thus be classified as a Severe Burn Injury (SBI) (Fig. 4).

In the context of the diagnostic setting where definitive care is provided, such as a Trauma Center or a Burn Center, the Deep Partial Thickness Burn should be limited to the diagnostic clinician. This too will fall within the SBI classification, since the use of the more descriptive term implies the person performing the assessment has a more common working knowledge of burn injury than the typical clinician who seldom manages serious burn injuries.

Burn care is a global healthcare issue, and it could be concluded from the findings that, as a profession, there is a lack of consensus to even discuss the most fundamental aspects of assessing a burn injury. However, we now have a unique opportunity to coalesce around something simple, and in demonstrating a willingness to tackle the simple, there will be hope for consensus as more difficult problems are confronted that have confounded researchers in burn injury and burn care.

RÉSUMÉ. Au fil des ans, la brûlure a été décrite en utilisant une variété d’étiquettes. Ces étiquettes ont oscillé entre un seul mot et des phrases, y compris degrés de blessures ou de termes plus descriptifs. Une recherche a été menée en s’appuyant sur un moteur de recherche internet. Après de multiples recherches variant les mots-clés, le top 100 des termes de recherche identifiés ou expressions les plus courantes, allant de la commune à la plus obscure. La recherche a été répétée en utilisant des termes ou des expressions les plus fréquentes identifiées dans le moteur de recherche internet, en mettant l’accent soit sur le titre ou le résumé de tous les articles indexés dans PubMed. Ce processus réduit l’attention de termes ou expressions les plus courantes utilisées par les professeurs dans leur travail publié. Par conséquent, ce travail a porté sur la mesure des termes spécifiques qui sont utilisées aujourd’hui et leur fréquence d’utilisation dans les journaux évalués par les pairs indexées dans le système PubMed. Il est difficile de se concentrer sur les aspects spécifiques de chaque profession donnée quand il y a confusion entourant un vocabulaire commun. En identifiant et en notant dans la littérature académique les étiquettes les plus couramment utilisées, un point de référence peut être créé pour les travaux futurs. En outre, un ensemble commun et précis des étiquettes qui sont appliqués uniformément à travers la profession est essentiel pour les universités à inclure dans les programmes de formation et d’éducation pour les médecins, les infirmières et le personnel paramédical.

Mots-clés: évaluation des brûlures, formation sur la gestion des brûlures, brûlure superficielle, brûlure d’épaisseur partielle, brûlure de pleine épaisseur
BIBLIOGRAPHY


COMMENTARY

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The authors must be commended for stressing the fact that when describing any injury or disease entity it is critical to have a common and accurate set of labels uniformly applied in the academic literature. This issue of how best to describe a given burn injury appeared to have been resolved a long time ago. However, despite the fact that the concept of classifying burn injuries by numerical degrees according to severity has been universally accepted, it is surprising to note that most professionals still increasingly refer to more descriptive terms in their scientific reports and publications.

We are all under the impression that using descriptive terminology rather than fixed numerical categories provides a more accurate description of burn depth and severity. In fact it is not so; numbers carry an inherent sense of rigor, sharpness and exactness that cannot be provided by descriptive classification which, by nature, can embrace a wide range of variability and interpretations. The ongoing inconsistent use of terms and phrases to describe the varying types of burn injury actually reflect persistent difficulties all concerned professionals experience when trying to accurately assess the extent and severity of a given burn injury.

It may be arguable however that burn injuries should be classified in only 3 categories because the skin has 3 layers. Moreover, the suggestion of the authors to group for the initial assessment and treatment the deep partial thickness burn, the full thickness burn, and the burn extending beyond the hypodermis under the full thickness burn classification, since their management is approximately the same, is even more debatable. Regardless of some practical advantages to this proposed classification, over-simplification is anatomically not correct and, as proven by some recent research, physiologically not sound. Deep partial thickness burns, though better treated by early tangential excision and grafting, still carry the potential for spontaneous re-epithelialization, which is greatly valuable in low and middle-income countries with limited resources where facilities for tangential excision and grafting may not be available. Moreover, edema formation and resolution differs somehow between deep partial thickness and full thickness burns; this may have great therapeutic implications not yet uncovered. On the one hand, limiting the deep partial thickness burn classification category to the diagnostic clinician in a Trauma Center or a Burn Center may create serious confusion. Practically, this entails adopting a double speed classification: one for initial assessment (3 categories) and another one for the more expert (4 categories), where full thickness burn of both classifications does not indicate the same level of injury.

On the other hand, reserving the classification of minor burn injury (MBI) to superficial burns is understandable, although classifying partial thickness and full thickness burns subjected to the rule of nines calculation as severe burn injuries (SBI) may be misleading since the severity of any burn injury is more dependent on its extent as well as other co-morbid conditions rather than on its depth and is better expressed as a severity score or Baux index. A 1-5% partial or full thickness burn is certainly not a severe nor a serious burn, even though it may require excision and grafting. Regardless, the authors have touched on important and critical issues and concepts, and will certainly trigger some brainstorming essential for much needed re-evaluation of our current assessments and practices.

AUTHOR’S REPLY

Our submission was intended to create a simplified approach to what continues to be ongoing confusion surrounding the terms we use. It was also our intent to rely on existing standards for greater than a 10% TBSA partial or full thickness burn to be included in SBI and otherwise, following an assessment, smaller partial and full thickness burns could be classified as a MBI. We accepted that as a general understanding but in retrospect, we should have been more specific.

It was also the intent of the authors to recognize that any clinician providing definitive care to the extent of grafting, or who possess the clinical skills to differentiate a deep partial thick burn when compared to both partial and full thickness burns, should provide a more expert assessment and where available, initiate the appropriate care. We were merely trying to account for the fact that all too often, patients with burn injuries are seen and initially managed by clinicians who lack more precise diagnostic skills.

Regardless, we see this as and hope this is seen as the start of the dialogue to create consistency and uniformity with some of the more basic principles of burn care.