The "Safdarjung Method" of Estimation of Total Body Surface Area (TBSA) Burns in Major Amputees

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Abstract

Accurate estimation of total body surface area (TBSA) burns is the cornerstone of initiating correct fluid therapy in burns. The current formulae are designed for patients with intact body. However, the authors having worked at a high-volume burns center (Safdarjung Hospital, New Delhi, India) have encountered patients with major amputations presenting with burns. The existing formulae are inaccurate for estimating TBSA in major amputees, leading to inaccurate fluid estimation in such cases. The authors have designed a novel method to estimate TBSA burns in patients with major amputations that involves a "correction factor" to account for the amputated parts.

Keywords
- amputees
- burn center
- burns
- methodology

Introduction

The Rule of Nines and Lund and Browder charts are widely used in calculation of the total body surface area (TBSA) burns.[1,2] However, these charts are designed for patients with complete/intact body and their use in major amputees gives an incorrect estimate of TBSA burns. A new method to calculate the TBSA burns in amputees was developed by authors during their tenure at Safdarjung Hospital, which has been proposed in this article.

Methodology

Safdarjung Hospital, New Delhi, India is a high-volume burns center treating approximately 5500 to 5800 burn patients with around 1700 admissions to burns unit annually. The formula was designed after encountering major amputees with burns during the past few years in whom the existing charts were considered unsatisfactory. A major amputation is defined as an amputation at the level of or proximal to ankle (for lower limb) or at the level or proximal to wrist (for upper limb).

The hypothesis was that in an amputee, the remaining body surface area should be considered as 100% and the body surface areas involved with burns should be assigned the percentage accordingly. The authors designed a simple method for quick calculation that can be easily used in emergency and involves a correction factor (CF), depending on the extent of amputation. The correction factor is calculated as follows:

Percent TBSA in an amputee = % TBSA calculated with existing system × CF

Where "*CF*" is the correction factor = 100/(100–% loss of body part due to amputation).

The details of calculation are illustrated in the following hypothetical example:

A 60 kg male with bilateral forequarter amputation presents with burns to anterior trunk.

According to the Lund and Browder chart, each upper limb makes 9.5% TBSA. So, in a bilateral forequarter amputee, the remaining total body surface area left behind is 81%. The remaining body surface area should be considered as 100% TBSA for this patient.

The CF is calculated as below:

CF = 100/(100–% of lost body part)
CF = 100/(100–19)
CF = 100/81 = 1.23

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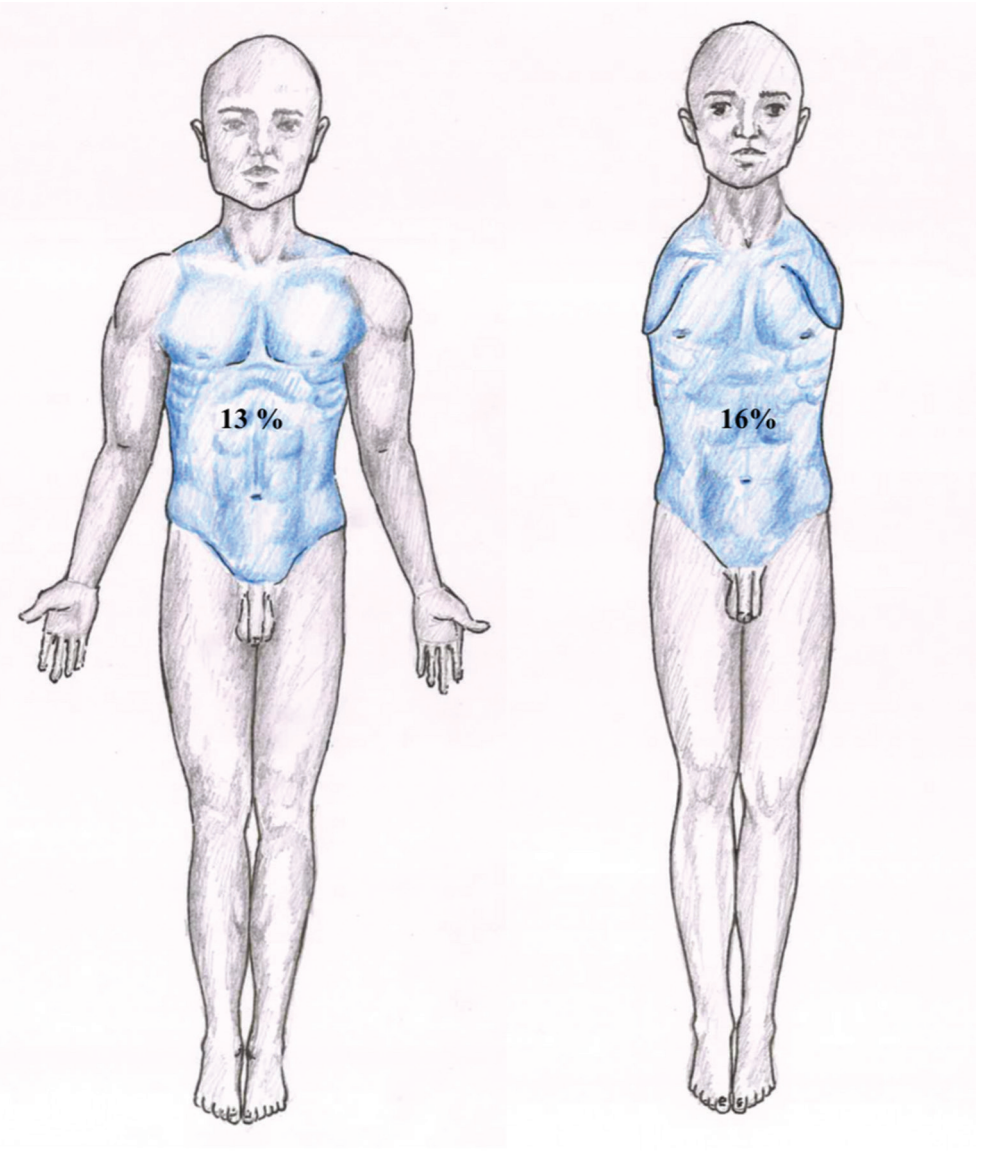

Fig. 1 Comparison of the TBSA burn of anterior trunk in a person with intact body and a patient with bilateral fore-quarter amputation. The anterior trunk burn in a person with intact body is 13% but in a patient with fore-quarter amputation it would be 13 x 1.23 (CF) = 16% using author's method. Abbreviations: CF, correction factor; TBSA, total body surface area.

According to Lund and Browder chart, anterior trunk TBSA burnt is 13%. According to our suggested calculation, his anterior trunk would make 13 × 1.23 = 16% of the TBSA **(►Fig. 1)**. Hence, this patient should be treated as 16% TBSA burn, and the fluid, calories and protein requirement must be calculated accordingly. The method has been named by the authors as the "Safdarjung method" of TBSA estimation in major amputees, as it was conceived by the authors while working at this hospital.

Discussion

The Wallace's rule of Nines, Lund and Browder Charts, Rule of Fives and Rule of Palm[1] described the calculation of TBSA in patients with normal body without any loss. Mathematically, these cannot correctly estimate TBSA in patients where there is loss of body parts. Correct calculation of TBSA burn is the basis of therapeutic guidelines in acute burn; hence, so many formulae. If the TBSA burn calculation is mathematically faulty, then rest of the therapeutic calculations and monitoring parameters will be inadequate. Hence, this calculation and use of CF in major amputee is expected to give a correct estimate of body surface area burn.

The authors have managed acute burn in a high-volume center for many years. The authors are aware that the initial fluid calculation using various formulae are only guidelines. The correct amount of fluid is dependent on the hourly urine output, pulse rate, and central venous pressure (CVP) monitoring. If there is minor variation in the calculation, it may not matter much. However, one needs to calculate the TBSA burn correctly, so that the initial fluid therapy is calculated to near perfection. A method with similar concept of TBSA

calculation in amputees has been published by Sarabahi and Bajaj in 2008.[3] However, the concept of calculation factor does not exist in their publication.

The advantages of this formula are as follows:

1. Simple to use.
2. Can be used for children and adults alike.
3. Can be used with any of the existing burn estimation methods.

The shortcoming of this calculation is that it has yet to be used clinically. The formula must be used at multiple centers across the world to evaluate its efficacy and utility in estimating TBSA and fluid requirements for burns in major amputees. However, getting adequate number of patients for such study is difficult in one center.

Conclusion

There is no formula designed, to the best of our knowledge, which calculates the correction factor, depending upon the level of burns to estimate TBSA burn in an amputee. The "Safdarjung method" is a simple, reliable, and mathematically correct formula for a quick and correct estimation of TBSA burn in amputees with burns.

Financial Disclosures
None.

Conflicts of Interest
None declared.

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