Results of an Internet Survey on the Treatment of Partial Thickness Burns, Full Thickness Burns, and Donor Sites

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The objective of this study was to analyze which materials and methods are used for the management of partial and full thickness burns, as well as donor sites. An Internet survey was used to poll directors of burn centers around the world on their preferences for local treatment of different types of burns and donor sites. Results were tabulated and expressed as a percentage of the total number of answers for a given indication. Although many new wound care materials have been launched in the last decade, few of these actually are used widely. The most commonly used materials for partial thickness burns and donor sites are still silver sulphadiazine 1% cream, other antimicrobial ointments and creams and impregnated gauze type dressings. Of the newly available treatment modalities, only two silver dressings were chosen frequently as a primary option for the management of partial thickness burns and donor sites. For full thickness burns, the primary choice is excision and grafting. The diversity of dressings and techniques indicated as preferred in this survey, including many that are known to have side effects, indicates that there is no consensus on topical treatment of partial thickness burns and donor sites. Many respondents prefer "tried and true" materials over newer dressings, particularly if the latter have not been tested in a clinical trial. (J Burn Care Res 2007;28:835–847)

During the last decade, the possibilities for treating wounds have been expanded: a number of new materials and techniques, most notably cultured cells (allogeneic and autologous), growth factor delivering systems, and dressings containing active agents (ie, antimicrobial compounds) have become commercially available and even more are currently under development. These materials and techniques might offer new and, perhaps, better possibilities for the wound management part of burn care: the silver dressings, for example, theoretically could replace silver sulphadiazine 1% cream, since pure silver offers a broader antimicrobial spectrum without the side effects attributed to silver sulphadiazine cream.

In 1998, we published the results of a global survey on the type of treatment used for the management of partial and full thickness burns.[1] In light of all the new materials and techniques that have become available, a similar survey was sent to the directors of a number of burn centers around the world. Its goal was to gather data on treatment modalities currently used in these centers and to investigate which, if any, new materials and techniques really have had an impact on the current status of burn care.

METHODS

Using the databases of the International Society for Burn Injuries[2] (ISBI), the European Burn Association,[3] and the American Burn Association,[4] 200 directors of burn centers worldwide were invited by e-mail to participate in an online survey. The survey was developed by the author and converted to an online research format by 3S Consulting Group, a strategic consultancy specializing in the wound care industry. The survey was maintained at www.woundcarejobs.com, an online job board owned and operated by 3S Consulting Group.

Upon entering the site, respondents were guided to the burn care survey, which contained questions on surgical and nonsurgical treatment of smaller (≤15–20% Total Body Surface Area [TBSA]) and

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larger (>20% TBSA) superficial and deep partial thickness burns, smaller and larger full thickness burns and donor sites.

For the questions on superficial partial thickness burns and donor sites, respondents had to choose three preferred treatment methods from a list (Table 1). In this list and throughout the rest of the survey, "antibiotic creams and ointments" were defined as those that did not contain silver sulphadiazine or iodine compounds, since these materials formed their own category. Similarly, for the category "impregnated gauze," those impregnated with silver sulphadiazine or iodine were to be classified under the drug name, not under the carrier (gauze and gauze like materials). Participants could also check an "other" box. If this was chosen, respondents were asked to specify their answer.

Table 1. Preferred treatment: partial thickness burns

Superficial Partial Thickness Burns Donor Sites	Deep Partial Thickness Burns
Silver sulfadiazine cream 1%	Silver sulfadiazine cream 1%
Silver sulphadiazine 1% cream with chlorhexidine	Silver sulphadiazine 1% cream with chlorhexidine
Cerium silver sulfadiazine	Cerium silver sulfadiazine
Antimicrobial cream or ointment (not silver sulphadiazine 1% cream or iodine)	Antimicrobial cream or ointment (not silver sulphadiazine 1% cream or iodine)
Saline gauze	Saline gauze
Medicated impregnated gauze (not iodine or silver sulphadiazine)	Medicated impregnated gauze (not iodine or silver sulphadiazine)
Iodine based material (ie, cream, impregnated gauze, iodophore)	Iodine based material (ie, cream, impregnated gauze, iodophore)
Sulfamylon	Sulfamylon
Chemical debridement, followed by dressing	Chemical debridement, followed by dressing
Amnion membrane, fresh	Amnion membrane, fresh
Amnion membrane, preserved	Amnion membrane, preserved
Allograft cryopreserved	Allograft cryopreserved
Allograft fresh	Allograft fresh
Allograft glycerol preserved	Allograft glycerol preserved
Allograft other	Allograft other
Xenograft	Xenograft
TranCyte	TranCyte
Cultured allogeneic cells, not TranCyte	Cultured allogeneic cells, not TranCyte
Biobrane	Biobrane
Glucan dressing	Glucan dressing
Biomaterials, other (please fill out)	Biomaterials, other (please fill out)
Alginate dressing (without silver)	Alginate dressing (without silver)
Hydrocolloid (without silver)	Hydrocolloid (without silver)
Hydrofiber (Aquacel, without silver)	Hydrofiber (Aquacel, without silver)
Foam dressing (without silver)	Foam dressing (without silver)
Film dressing (without silver)	Film dressing (without silver)
Silicone (ie, Tendra) dressing	Silicone (ie, Tendra) dressing
Polymem	Polymem
Silver dressing: Arglaes	Silver dressing: Arglaes
Silver dressing: Silvercel	Silver dressing: Silvercel
Silver dressing: Acticoat	Silver dressing: Acticoat
Silver dressing: Aquacel Ag	Silver dressing: Aquacel Ag
Silver dressing: Contreet H	Silver dressing: Contreet H
Silver dressing: SilvaSorb	Silver dressing: SilvaSorb
Silver dressing: Silverlon	Silver dressing: Silverlon
Silver dressing: other (please write brand name)	Silver dressing: other (please write brand name)
Vacuum assisted closure	Early excision and same session grafting
Other (please fill out)	Early excision, Integra coverage, delayed grafting
	Early excision, allograft coverage, delayed grafting
	Early excision, other, delayed grafting
	Late excision (please fill out therapy used prior to excision)
	Vacuum assisted closure
	Other (please fill out)

A similar setup was used for questions on deep partial thickness burns, although the options list was expanded (Table 1) and included several excision and grafting techniques as well as the use of Integra (Integra LifeSciences, Plainsboro, NJ). Again, three preferred options had to be checked and an option "other" was included.

Although for most of the given treatment options in the lists generic names were used, some materials and methods were mentioned by brand name, particularly those that were new or are heavily promoted in the burn market. Furthermore, when materials within one group (as is the case particularly for the silver dressings) were claimed by their manufacturers to be very different from each other, they were listed with their specific brand name.

Among the specifically listed materials were Sulfamylon® (Mylan Laboratories, Canonsburg, PA) (mafenide acetate cream or solution), Trancyte® (Advanced Bio-Healing, New York, NY) (human fibroblast-derived temporary skin substitute), BioBrane® (Mylan Laboratories, Canonsburg, PA) (biosynthetic wound dressing constructed of a silicon film with a nylon fabric), and Aquacel® (ConvaTec, Skillman, NJ) (hydrofiber dressing). Other materials, listed by brand name included Polymem® (Ferris Mfg. Corp., Burr Ridge, IL) (hydrophilic polyurethane membrane matrix with a film backing), Glucan® (Brennen Medical, Inc. St. Paul, MN) (beta-glucan combined with collagen) and VAC® (KCI, San Antonio, TX) (a vacuum assisted closure system). The following silver containing dressings were specified by name: Arglaes® (Medline Industries, Mundelein), Acticoat® (Smith & Nephew, Largo, FL), Aquacel Ag® (ConvaTec, Skillman, NY), Contreet H® (Coloplast A/S, Humlebaek, Denmark), SilvaSorb® (Medline Industries. Mundelein, IL), Silvercel® (Johnson and Johnson Wound Management, New Brunswick, NJ), and Silverlon® (Argentum Medical, Chicago, IL).

For full thickness burns, two answers had to be chosen from a list, which, again, included an option "other." When this option was checked details had to be specified (Table 2).

Table 2. Preferred treatment: full thickness burns

Chemical debridement and secondary (in this context: not in one sessio) grafting
Early excision and same session grafting
Early excision, Integra coverage, delayed grafting
Early excision, allograft coverage, delayed grafting
Early excision, other, delayed grafting
Late excision (please fill out therapy used prior to excision)
Other (please fill out)

On the management of full thickness burns specifically, a series of additional questions was asked, including to what extent sandwich technique (widely meshed autograft, covered with narrowly meshed allograft) and intermingled technique (autograft, applied in small holes in an allograft sheet) were used and when, in full thickness burns, excision usually was started. Questions were also raised about the use of cultured skin. Furthermore, the respondents were surveyed on their preference for large surface coverage vs cosmetic and functional coverage in large burns and the largest mesh size used. Finally, questions were raised about the frequency of use of Integra and for what indication (primary coverage or reconstruction) this material was applied.

RESULTS

The 200 requests for participation in the survey resulted in 59 replies, representing a 30% return. Of the 59 respondents, 17 (28.8%) were located in Asia, 18 (30.5%) on the North American continent (Canada, USA, Mexico), 15 (25.4%) in Europe, four (6.8%) in Africa, three (5.0%) in South America, and two (3.4%) in Oceania (percentages in this article may not add up to 100, because of rounding off). This percentage roughly reflects the relative number of dedicated burn centers in the different parts of the world.

According to the ISBI classification,[2] 39 respondents (66.1%) came from high-income countries and 20 (33.9%) from low-income countries.

Responses were tabulated and calculated per material or technique as a percentage of the total number of responses for a given indication. Because of rounding, not all percentages given in this report add up to 100. Throughout this article, materials that scored 0% are excluded from the figures.

Partial Thickness Burns

For partial thickness burns of different sizes, the following dressings and techniques scored more than 1.5% in one or both size categories (≤15–20% TBSA and >20% TBSA): silver sulphadiazine 1% cream (different brand names), silver sulphadiazine 1% cream with chlorhexidine 0.2% (Silvazene [Smith & Nephew, Largo, FL]), silver sulphadiazine 1% cream with 2.2% cerium nitrate (Flammacerium® [Solvay, Brussels, Belgium]), chemical debridement followed by a dressing, antibiotic creams and ointments, impregnated gauze, glycerolized allografts, and xenografts. Similar scores (>1.5%) were also obtained for Trancyte, Biobrane, hydrocolloids, Aquacel, foam and film dressings, two silver dressings (Acticoat, Aquacel Ag), and the group "other" taken as

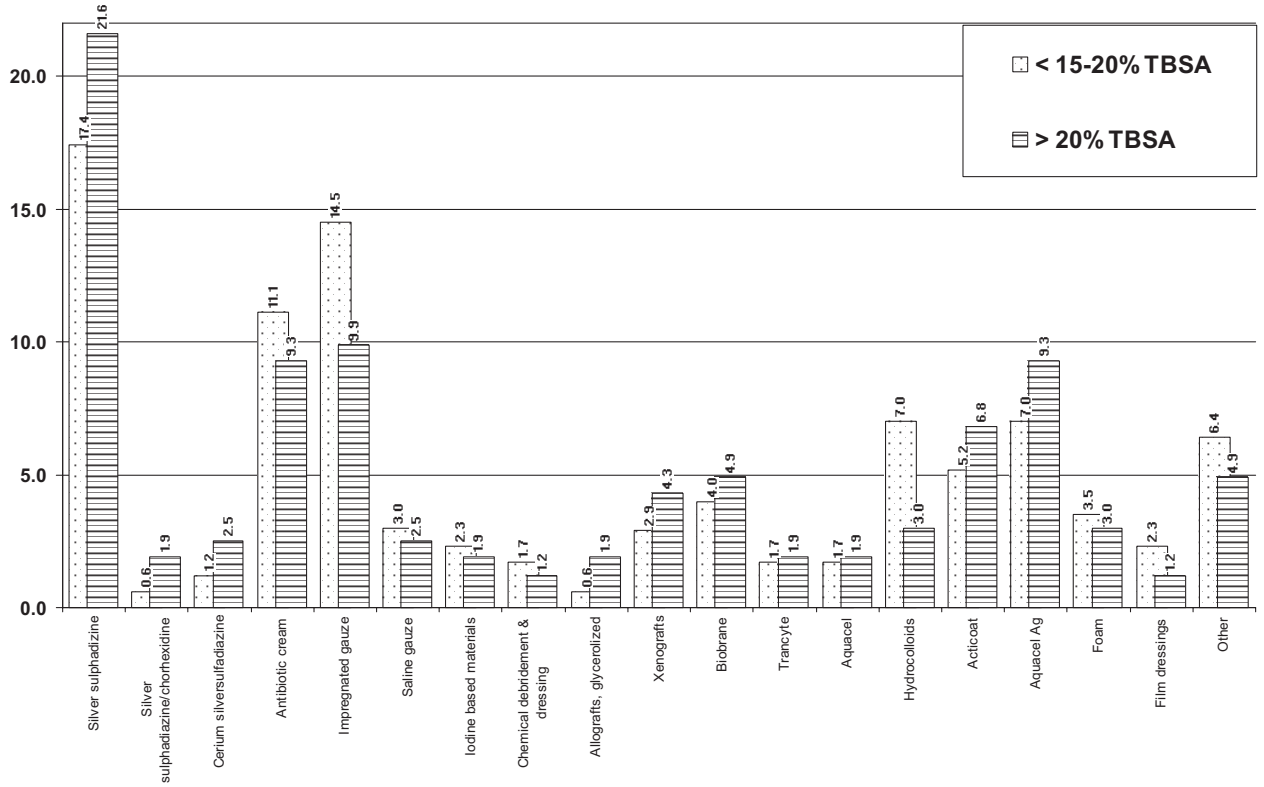

Figure 1. Superficial partial thickness burns, score >1.5%.

a total (Figure 1). Materials and techniques that scored less than 1.5% are listed in (Figure 2).

The "other" category included treatment modalities such as MEBO® cream (several manufacturers), honey dressings (no specific manufacturer mentioned), Biocream® (several manufacturers), a hyaluronic acid dressing, a corticosteroid cream, a hydrogel, cultured autografts, and paper tape.

For smaller (≤15–20% TBSA) and larger (>20% TBSA) deep partial thickness burns, treatment modalities which scored more than 1.5% in one or both of the size classifications included silver sulphadiazine 1% cream, silver sulphadiazine 1% cream with chlorhexidine 0.2%, silver sulfadiazine 1% cream with 2.2% cerium nitrate, antibiotic creams and ointments, impregnated gauze, saline gauze, iodine-based materials, and Sulfamylon. Additional materials and techniques that scored similar results were chemical debridement and dressings, cryopreserved allografts, xenografts, Trancyte, hydrocolloids, Acticoat, Aquacel Ag, early excision and grafting, early excision followed by application of Integra and late grafting, early excision followed by allograft coverage and delayed grafting, delayed grafting and the group "other," which scored a total of 9% for deep partial thickness burns ≤15 to 20% TBSA and 4.1% for those larger than 20% TBSA (Figure 3). Many treatment modalities scored less than 1.5%: they are listed in (Figure 4).

The "other" category for deep partial thickness burns included materials and techniques such as MEBO and MAEO® (Thursday plantation, Ballina, NSW, Australia) cream, honey dressings, Biocream, hyaluronic acid dressing, herbal formula dressing (not specified), cultured autografts, allogeneic keratinocytes, and basic-fibroblast growth factor (b-FGF).

Donor Sites

For donor sites, the preferred treatments that scored more than 5% were silver sulphadiazine 1% cream, impregnated gauze, alginates, hydrocolloids, film dressings, and Aquacel Ag (Figure 5). Lower scores were obtained for silver sulphadiazine with chlorhexidine, antibiotic creams and ointments, saline gauze, iodine-based materials, fresh and preserved amnion membrane, fresh allografts, xenografts, cultured allografts, Biobrane, Glucan, Aquacel, foam and silicon dressings, Polymem, Acticoat, and SilvaSorb. The "others" group scored 7.8% combined and included MEBO cream, elastic bandage, scarlet red, hyaluronic acid dressing, corticosteroid cream, Hypafix® (Smith

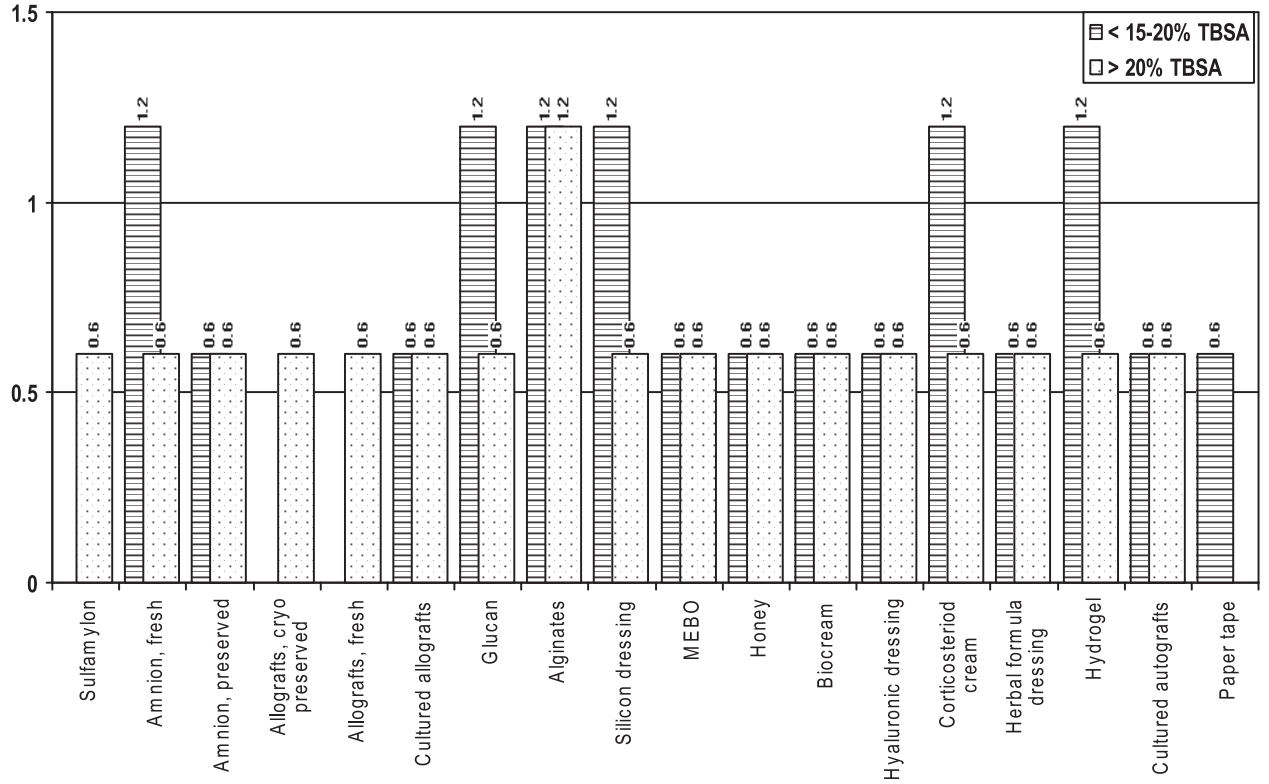

Figure 2. Superficial partial thickness burns, score <1.5%.

& Nephew, Largo, FL) (a low allergy adhesive, non woven dressing retention sheet), herbal formula cream, SkinTemp® (BioCore Medical Technologies, Elkridge, MD) (a fibrous collagen dressing), Surfasoft® (MediProf Medical Products, Moerkapelle, the Netherlands) (a nonwoven nylon dressing), cultured allografts, and a nonspecified hydrogel.

Full Thickness Burns

The preferred treatment methods for full thickness burns smaller than or equal to 15 to 20% TBSA were chemical debridement and delayed (not in the same session) grafting (8.3%), early excision and same session grafting (44.4%), early excision followed by application of Integra and delayed grafting (9.3%), early excision followed by allograft application and delayed grafting (14.8%), and late excision (5.6%) (Figure 6). Thirteen percent of the respondents performed early excision with delayed grafting without specifying the intermediate therapy.

The group "other" scored a total of 4.6%, and included early excision with same session grafting overlaid with Alloderm®, representing a modified sandwich technique, herbal dressing, debridement and b-FGF, early excision and xenograft coverage, excision and coverage with cultured epithelial autograft and "flexible surgical approach" (Figure 6).

If late excision was chosen, pretreatment was with silver sulphadiazine 1% cream (two respondents), cerium silver sulphadiazine cream (two respondents), and saline dressings (one respondent). One respondent did not answer the question on pretreatment and one specifically mentioned that "early excision is not possible in my environment," without specifying which alternative method was used.

For large full thickness burns (>20% TBSA), the preferred techniques were chemical debridement and late (not same session) grafting (6.4%), early excision and same session grafting (34.9%), early excision followed by application of Integra and delayed grafting (13.8%), early excision followed by allograft application and delayed grafting (22.9%), early excision and delayed grafting with another, not specified, intermediate coverage (11.9%), and late excision (8.3%) (Figure 6). For this wound type, the group "other" represented 1.8% of the total number of responses and included herbal dressing, and excision followed by application of cultured epithelial autografts. In the group "late

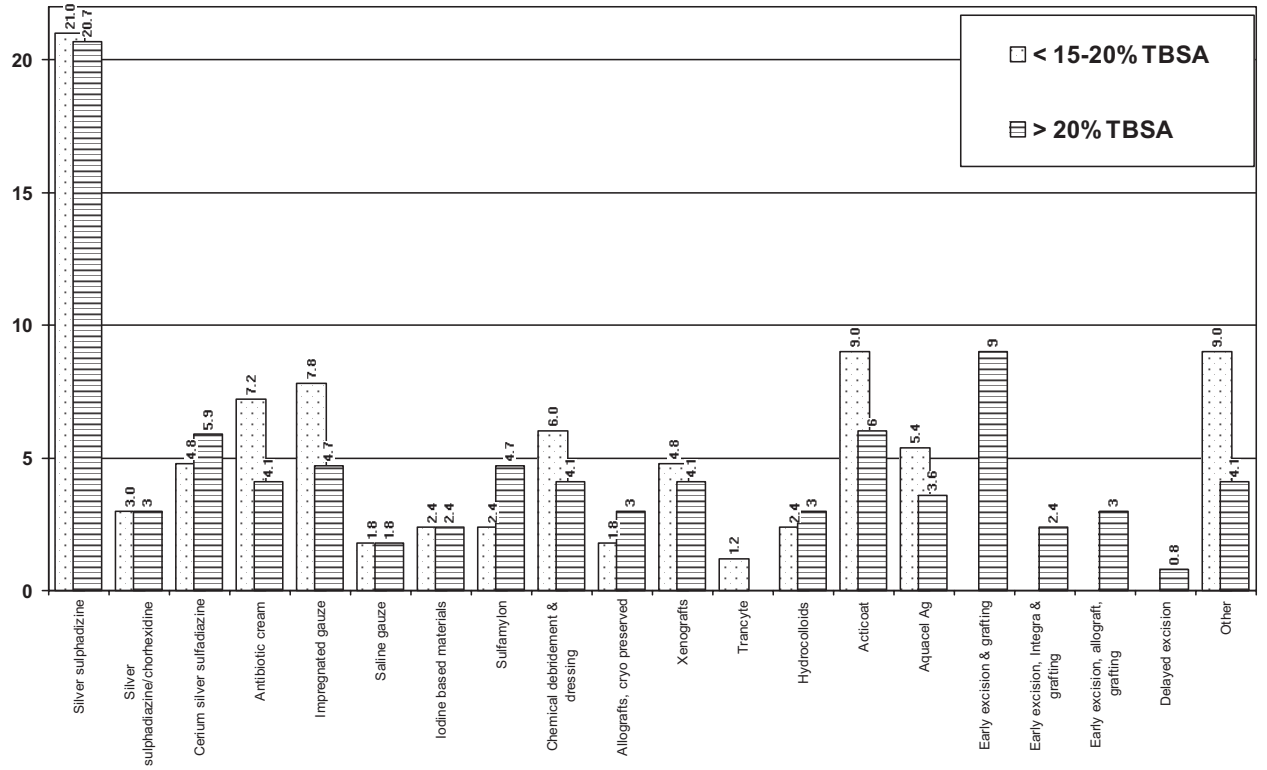

Figure 3. Deep partial thickness burns, score >1.5%.

excision, " four respondents used silver sulphadiazine cream as pretreatment, two applied cerium silver sulphadiazine cream, one used saline dressings, one Biocream, and one preferred "iodine solution to dry out the wound."

In large burns, 64.4% of all respondents chose to excise and graft large surfaces first and 35.6% opted primarily for cosmetic and functional areas.

In clearly full thickness burns, 30.5% of respondents chose to excise within 2 days after burn, 49.2% within 5 days after burn, and 20.3% 5 days after burn.

Fifty percent of the participants use cultured cells (of any type) and 50% of respondents never use this option. For those who use cultured cells, 76% use autologous cells primarily, 10% allogeneic cells, and 14% use both cultured allografts and autografts. Of the positive responders, 55.2% use commercially available grafts and 44.8% grow the grafts within their own, or at another, noncommercial facility.

Of the total, 32.2% never use Integra, 37.3% seldom use the material, while 20.3% and 8.5% use Integra regularly or frequently, respectively. Integra is always used by 1.7% of the respondents (Figure 7). Integra is used after primary excision by 17.5% of respondents, for reconstructive surgery by 35% and for both purposes by 47.5%.

The sandwich technique is never used by 39.0%, seldom by 40.7%, regularly by 11.9%, frequently by 8.5%, and always by 0% (Figure 7). For the use of the intermingled technique, these numbers are 74.6, 20.3, 1.7, 1.7, and 1.7%, respectively (Figure 7).

With regard to mesh size, 5.6% never use expansion ratios larger than 1:1.5 and 9.3% do not use mesh sizes wider than 1:2. Mesh 1:3 was the largest sized used by 37% of the respondents, and a maximum expansion ratio of 1:4 is used by 18.5% of respondents. The maximum mesh size of 1:5 and 1:6 is used by 1.9 and 20.3% of the respondents, respectively. Instead of using mesh, 1.9% used cut slits, and 3.7% never used mesh. In one case (1.9%), an incorrect answer was given.

Stratification of Results Based on Country Income Level

An analysis of the specific responses from ISBI-designated low-income countries showed that modern materials and techniques are used relatively less frequently in these countries.

Of all responses, 33.9% came from burn centers in low-income countries. However, for superficial partial thickness burns ≤15 to 20% TBSA, of all participants who selected Acticoat, only 11.1% came from

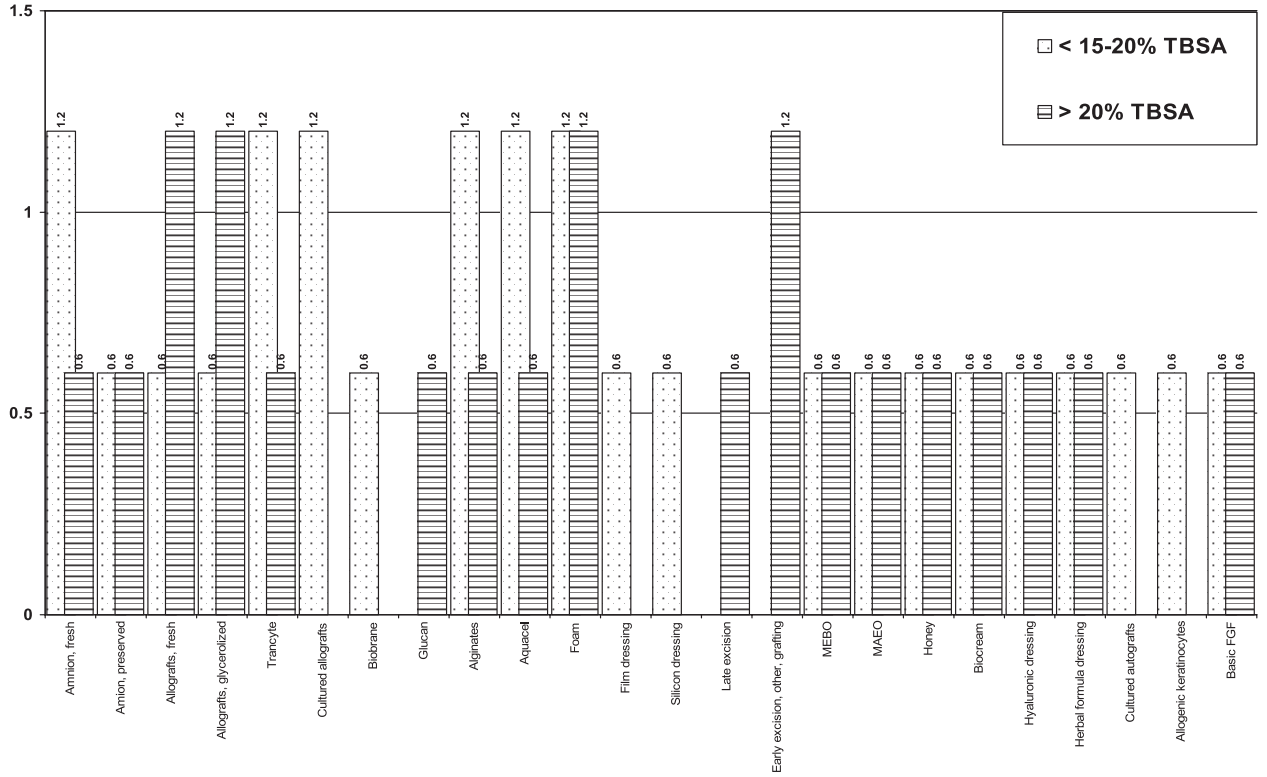

Figure 4. Deep partial thickness burns, score <1.5%.

these countries. For hydrofiber, this percentage was 33.3%. For partial thickness burns, >20% TBSA Acticoat was chosen by 0%, while Aquacel Ag users in poor countries only constituted 20% of the total respondents who selected this material as one of their three preferred treatment options.

For deep partial thickness burns, ≤15 to 20% TBSA, the percentage of respondents from poor countries that chose Acticoat was 9.1% and for Aquacel Ag the percentage was 20%. None of the modern materials was used in deep partial thickness burns >20% TBSA. For donor sites, these relative percentages were 14.5, 17.1, and 7.3% for Biobrane, Silicon dressing and Aquacel Ag respectively. If usage of modern materials had been similar in low-income and high-income countries, these percentages should have been much closer to 33.9% (the percentage of low-income countries respondents).

For all full thickness burns, only 4% of all respondents who use Integra as a preferred way of treatment after excision were located in low-income countries and the relative percentage of respondents from these countries who use (home grown) cultured cells in full thickness burns was 7%. Of poor country respondents, 14.8% mentioned that they had no possibilities of using a mesh graft at all. They also rarely use complex grafting techniques such as the sandwich or intermingled technique.

Of all respondent who never use Integra, 58% was from low-income countries. For seldom, frequently, regularly, these scores were 27, 8, and 20%, respectively. None of the respondents in the low-income countries always uses Integra.

With respect to the day of first excision, 33% of the respondents from low-income countries excise within 2 days, and 24% within 5 days (in 30% no answer was given).

Stratification Based on Geographical Location

In contrast to stratification on the income level of a respondent's country, geographical location per se did not show significant differences, other than those based on availability of specific products. For example, at the time of writing, no silver-impregnated dressings were available in Japan, nor was Integra. Consequently, these materials are not used in the country.

Similarly, the Euro skin bank is a Dutch organization, which sells glycerolized cadaver skin, mostly to European burn centers. Therefore, it is logical that this type of allograft is used more often in Europe than in coun-

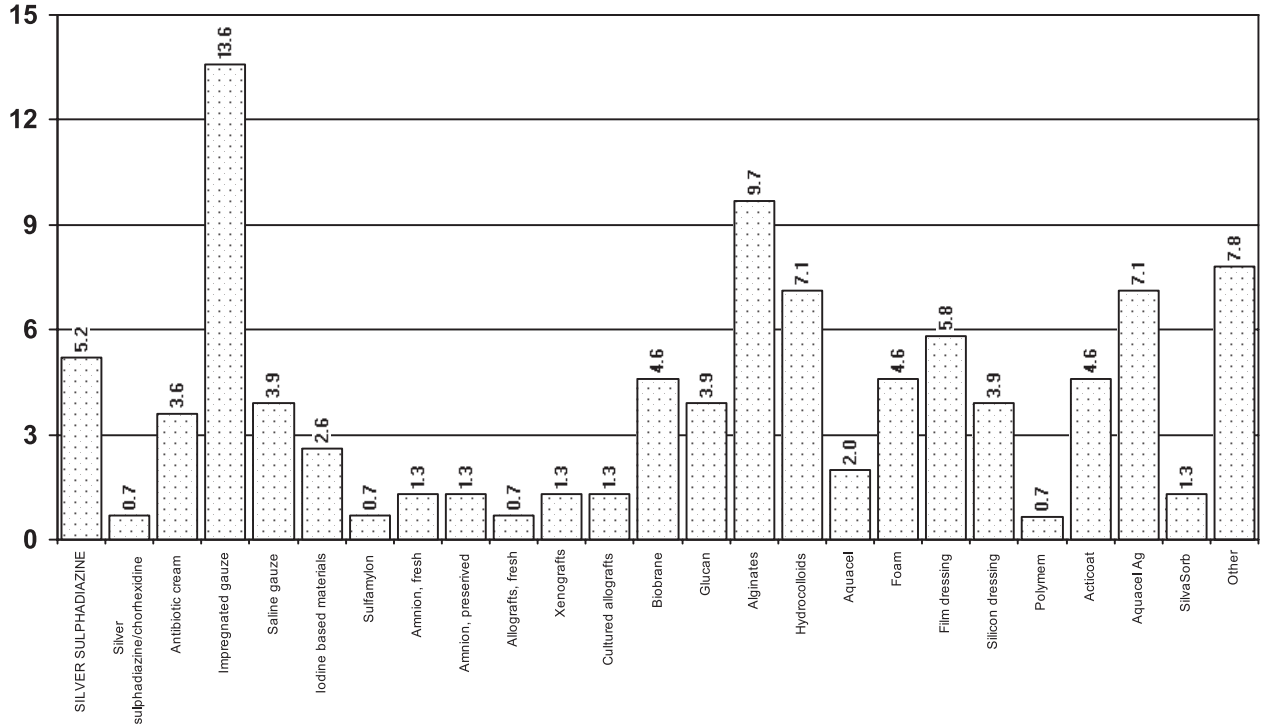

Figure 5. Donor sites.

tries outside that continent. Silver sulphadiazine with cerium is also primarily a European product.

DISCUSSION

An Internet survey has a number of limitations inherent to the medium used: the level of access to the Internet is not universal among different parts of the world: particularly in poor countries Web access is not widely available.[5] Furthermore, the e-mail address databases used for this survey were not up to date: a considerable number of e-mailed requests for participation in the survey returned an "undeliverable" message. Consequently, it is impossible to know who did not receive the request or did receive it but decided not to participate in the survey. Therefore, it is likely that the actual response rate was significantly higher than 30%.

At the same time, again because of the nature of the Internet, it is also likely that not all parts of the world are represented equally, or even pro rata.

Many of the modern dressing and treatment modalities, such as cultured cells and Integra, are relatively expensive. As supported by the comments of some respondents, the use of these materials and modalities is therefore fairly uncommon in the countries designated by the ISBI as "low-income countries." Respondents from the low-income countries represented 33.9% of all respondents, but when the relative percentage of usage of modern materials and techniques (low-income country usage divided by total use) is calculated, virtually all relative percentages are significantly lower than 33.9%.

There were no major differences, other than those based on availability of products and materials, when geographical locations per se were compared.

For the care of some types of chronic wounds, more or less formal guidelines exist on what to use where and when[6–10]: even with these guidelines, consistency in choice among different caregivers is low.[11,12] Despite a few attempts, for the management of partial thickness burns such guidelines have never been accepted globally, and, indeed, the broad range of materials used for the treatment of this type of lesions, even within one country or region of the world, reflects this observation.

For the treatment of partial thickness a large number of different treatment option are used. However, many materials were only mentioned by one or two of the respondents, corresponding to percentages below 1.5%. Therefore, though arbitrary, this percentage has been chosen for the article as the "cutoff" number in generating the different figures. Silver sulphadiazine 1% cream has been around for nearly 40 years.[13] Still, this material consistently obtained very high scores for the man-

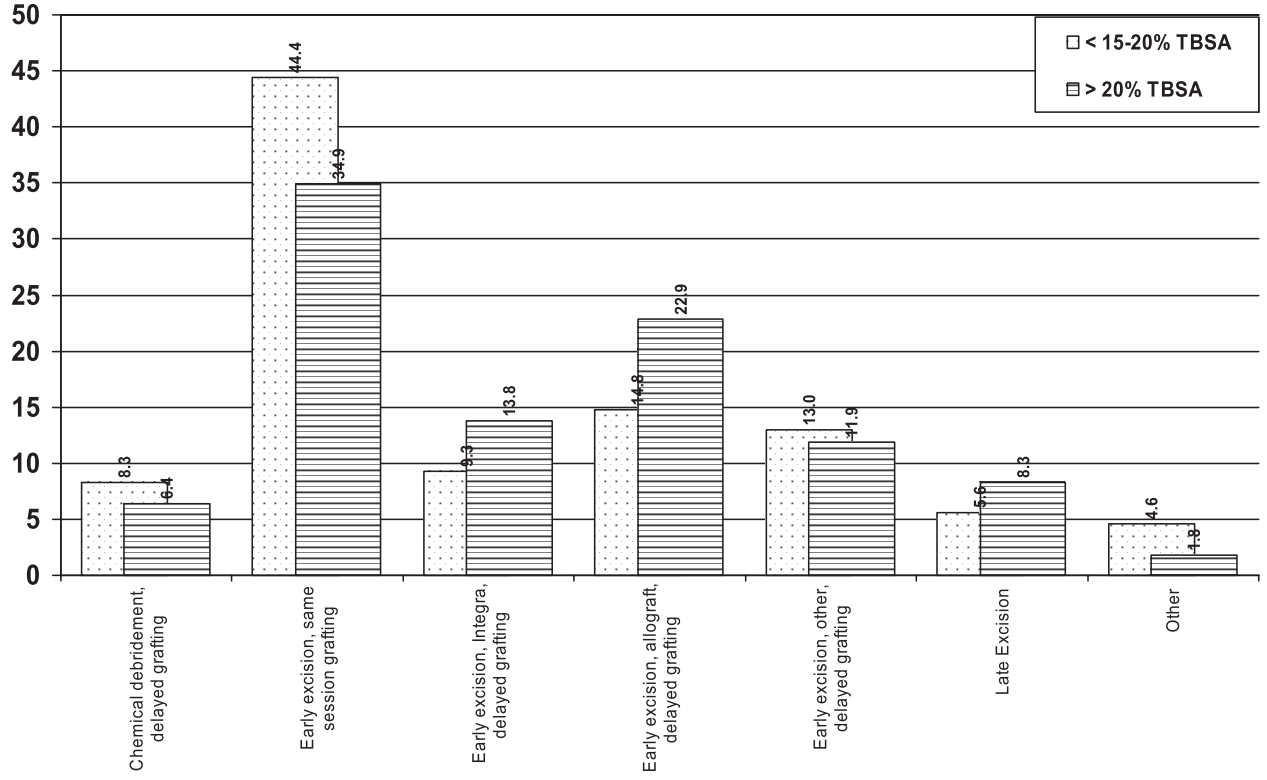

Figure 6. Full thickness burns.

agement of partial thickness burns, despite recognized disadvantages such as the formation of a pseudo-eschar,[14,15] allergic reactions to the compound,[16] the limited efficacy in Gr^+ microorganisms,[17] and resistance of certain microorganisms.[18] Similarly, impregnated gauze also scored very high, while this group of materials is known to be inferior with respect to time to complete healing and reduction of pain when compared with more modern materials such as alginates.[19–22] Some modern materials have been shown to be more cost effective than gauze-type dressings as well.[23] Other high scores in the superficial partial thickness burns category were for antibiotic creams and hydrocolloids, and both groups of materials have been around for at least 25 to 30 years. The only new materials (first on the market ≤10 years ago) that reached scores of 5% or higher for the management of partial thickness burns were two of the silver dressings, Acticoat, and Aquacel Ag. All other new dressings scored substantially lower.

For deep partial thickness burns, the results were very similar. However, a few additional treatment options scored high as well: chemical debridement followed by a dressing, and early excision and grafting both scored above 5% positive responses. Again, the only new treatment modalities that scored above 5% were the previously mentioned silver dressings, Acticoat, and Aquacel Ag (Aquacel Ag for burns ≤15–20% TBSA).

For both superficial and deep partial thickness burns, particularly interesting treatment modalities were mentioned in the "other" categories.

Moist exposed burn ointment (MEBO) is an oil-based ointment containing sesame oil, beta-sisterol, berberine, and small quantities of other plant ingredients. Beta-sisterol has anti-inflammatory properties,[24] and berberine is known to be antimicrobial.[25] MEBO is mainly used in Asia.[26,27]

MAEO cream, short for Melaleuca Alterniflora Essential Oil, contains essential oils from the paperbark Melaleuca tree (the oil is commonly known as tea tree oil). The compound is said to have antimicrobial properties[28] and, when applied early, seems to contribute to reducing thermal tissue damage.[28]

Honey has seen a renaissance in recent times in the treatment of burns, surgical wounds and skin ulcers. Although the type of honey is important with regard to specific properties, generally, the material is known to provide a moist wound environment,[29] and to reduce inflammation.[30] In addition, honey has been shown to have antimicrobial properties.[30,31]

Biocream (also known as ambiphilic dermatological cream and unguentum M) contains aerosil, paraf-

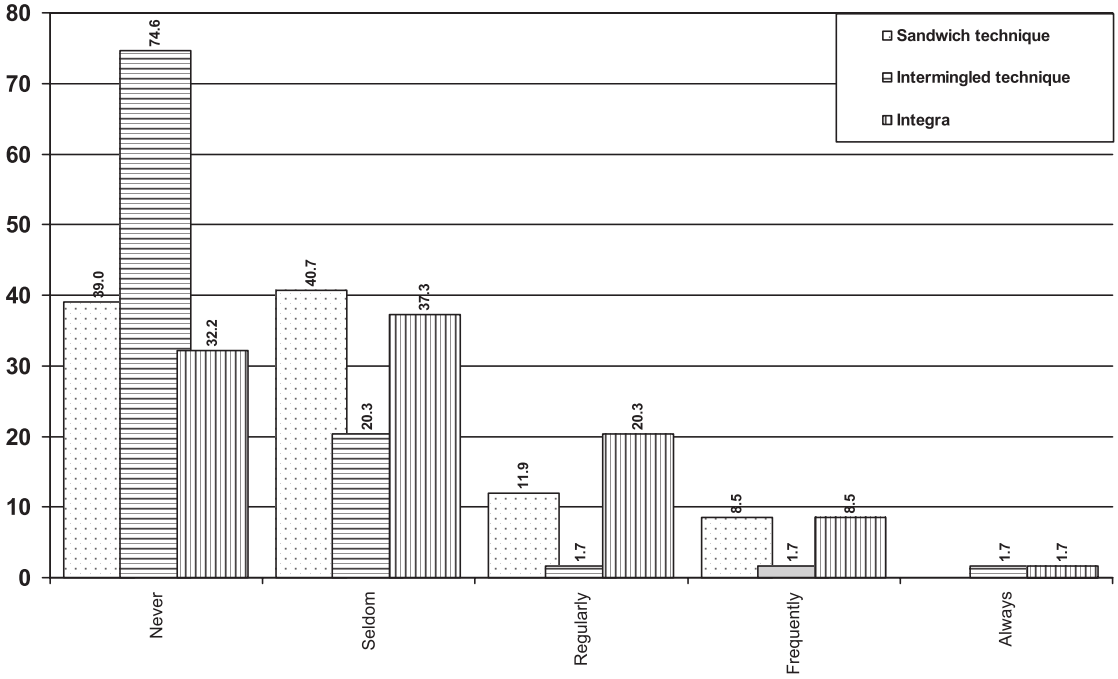

Figure 7. Sandwich, technique, Intermingled technique, Integra.

fin, Vaseline, cetostearol, sorbimacrogol palmitate, monostearin, miglyol, ascorbic acid, propylene glycol, and water. No specific information could be found on the role of this material in burn care or wound care in general.

The role of hyaluronic acid (hyaluronan) in the extracellular matrix and the wound healing process is well established, and dressings based on hyaluronic acid have been used for the management of different types of ulcers.[32–34] Two trials in partial thickness burns[35,36] show the combination of silver sulphadiazine 1% cream and hyaluronic acid to be superior over silver sulphadiazine alone.

b-FGF is a multifunctional polypeptide that regulates and stimulates differentiation and growth of a number of cell types, including dermal fibroblasts, keratinocytes, and endothelial cells.[37] No information could be found on the use of this growth factor in burn care.

The most commonly used materials (chosen by >5% of respondents) for the treatment of donor sites are silver sulphadiazine 1%, impregnated gauze, alginates, hydrocolloids, film dressings, Aquacel Ag, and "other."

The "others" group for donor sites included largely the same materials as those used for partial thickness burns. In addition, Scarlet red (Sherwood Medical, St. Louis, MO), Hypafix, SkinTemp, and Surfasoft were mentioned. Scarlet red, a sterile ointment dressing, has consistently been shown to be inferior to several types of modern dressings.[38–40] Hypafix is a retention sheet. Although not specifically designed as a wound contact layer, this material has been used successfully for donor site management.[41] SkinTemp is a collagen-based, fibrous dressing, which, in a small clinical evaluation, was shown to be superior to impregnated gauze for the management of donor sites.[42] Surfasoft, a nylon mesh material, was designed as a graft fixation dressing and has been used successfully in this indication.[43–45] No information could be found on its performance on donor sites.

With regard to full thickness burns, both large and small, the results of the survey did not generate great surprises: the large majority of respondents prefer to do early excision, which has been shown to reduce morbidity, and according to some studies, mortality, when compared with late excision.[46–49] Same session grafting was generally preferred over delayed grafting with a temporary coverage (ie, Integra, allografts), though in a higher percentage for smaller full thickness burns: it is likely that delayed grafting after excision may be necessary because of limited availability of donor sites, theater time and other resources, morbidity of the patient, etc.

If late excision was the chosen primary option, silver sulphadiazine and cerium silver sulphadiazine were the most commonly mentioned methods of "pretreatment."

Of the survey participants, 79.7% choose to excise within 5 days after burn and 20.3% after that period.

Logical reasons for choosing late excision over early excision are limited facilities (operation room, blood bank) and personnel as well as uncertainty about the actual depth of the burn, morbidity of the patient (ie, late referral), etc. Late excision may also have been chosen by those who prefer to use cultured grafts and may be made technically easier when cerium silver sulphadiazine was the primary choice as the "pretreatment" topical agent.[50–52] Cerium silver sulphadiazine is not available in all countries: this may influence the preference for time of grafting as well.

Of all the respondents, 64.4% chose to excise and graft large surfaces first and more than 50% do not use a mesh ratio larger than 1:3.

The use of complex grafting techniques, such as sandwich grafting and intermingled grafting is, according to the survey, not very common, although both techniques have specific advantages, particularly for large burns.[53–57] Originally, sandwich and intermingled techniques were used with autografts and human allografts from a skin bank. Nowadays, cultured allografts often are used, as are artificial skin products and other modalities. Whether or not these techniques can be used in the first place depends on a number of factors, including the availability of material for the overlay (banked skin, cultured skin, etc) and infrastructure.

The use of Integra is more widespread. This material has been around for more than a decade. It is relatively expensive which, in combination with it not being available in all markets, limits access to it. Of the total respondents, 13.8% describe excision and subsequent application of Integra as their preferred way of treating large full thickness burns (9.3% for smaller full thickness burns), and 32.2% state that they never use the material. Of those who use it, approximately 50% indicate using the material both for primary and reconstructive surgery.

Excision and coverage with cultured autografts is the preferred choice of only 0.9% of the respondents, both for smaller and large full thickness burns. Still, 50% of all respondents indicate that they used cultured autologous cells. Other than personal preference, the use of these cells obviously depends on economical and infrastructural factors (ie, are they commercially available, is there a culturing laboratory available), the possibility of proper wound protection (ie, with allografts, Integra) in between the period of excision and application of the cultured cells, and many other factors.

Complex grafting techniques and the use of Integra are expensive and require the appropriate infrastructure: as expected, they are relatively seldom used in low-income countries.

CONCLUSION

For the nonsurgical treatment of burns and as treatment of donor sites, "traditional" materials such as silver sulphadiazine cream and impregnated gauze are still the most widely used. Newer materials, with the exception of two silver dressings, Aquacel Ag and Acticoat, have not had a major impact; thus, there seems to be a difference between the "standard treatment protocol" and the "state of the art."

The low acceptance of new materials may be caused by a number of factors: limited global availability may be one of them. The price of new materials and techniques may also be a factor although it should be mentioned that cost-effectiveness (how a material influences the overall cost of managing a given medical condition) is different from the cost of an individual product and, to a large extent, driven by factors other than the product per se.[58]

True clinical proof for new products, in the form of controlled, comparative clinical trials,[59] is often lacking. In many countries, dressings, when registered as devices, do not need to be tested extensively in clinical trials. Thus, real evidence-based medicine[60] is more difficult to execute because of the lack of true evidence for many materials. It is likely that burn care health providers, in light of the often life-threatening conditions they are confronted with, are more careful and skeptical in testing a material that was not proven safe and effective in a clinical trial. At the same time, some materials are still widely used in burn care and donor site care, despite well-documented side effects and disadvantages such as pain to the patient, prolonged healing time, and reduced cost-effectiveness.

This controversy emphasizes the need for a structured review of treatment modalities for different types of burns and donor sites as well as for a consensus on which materials and techniques should be used for which indication and which should be abandoned.

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