Clinical Principles of Burns
Regenerative Medicine and Therapy
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Standardized Local Treatment of the Burns Wound

Background Information of Standardized Local Treatment and Sources

In clinical burns treatment, as in all areas of medicine, there is a ‘voltage drop’ between the rarified academic environment and the trenches of clinical practice. The clinician often cannot keep abreast of academic advances in treatment techniques. Many experienced doctors may disregard innovations preferring to stay with the ‘tried and true’. In some cases, fidelity to past protocols and maintenance of their dignity and reputation is more important than the actual therapeutic results experienced by their patients. Thus we see in medicine, as in all arenas of human commerce, an unfortunate phenomenon whereby the innovator must promote an improvement in the status quo to a temperamentally unresponsive professional audience. Rather than being accepted on their own merits, innovations are typically greeted with a cold shoulder and an unfortunate degree of suffering is visited upon patients until the paradigm shift is accomplished. Rare is the doctor who seeks out and consults an inventor about proposed improvements in clinical protocols. Even in today’s information age where theories and practices can be easily investigated, many doctors remain unable or unwilling to consider proposed improvements to conventional and outdated treatment techniques.

In order to meet this challenge and to demonstrate to medical professionals and the public the benefits of an innovation in burns treatments, this chapter will present a comparison of two groups of clinical pictures of burns patients treated either by the contemporary methods or by the burns regenerative medicine and therapy (BRT) protocols (MEBO/MEBT). These pictures compel the viewer to rise above petty loyalties to different schools of thought and to rely instead upon the desire to offer the best possible care to those suffering from burn injury. These pages invite burns doctors around the world to join the collaborative effort and further this exciting area of research and clinical care.

The author has restrained himself from commenting on the relative therapeutic effects pictured below, choosing instead for the reader to experience their merit for him/herself.

Sources of Representative Cases

Case of extensive deep burns treated by conventional surgical dry therapy (excision and skin grafting, abbr. dry therapy): A case of 71% third-degree burns, source from a burns center standing for the international level of burns surgery. Another case with 81% third-degree burns treated with cultured composite autograft (CCA) technology, and the data from the international journal Burns [vol. 25, No. 8, 1999].

Extensive deep burns treated by BRT (MEBT/MEBO): A case of 85% third-degree extensive burns treated by a burns team led by Professor Rongxiang Xu who is the inventor of this therapy, data from The Chinese Journal of Surface Burns, Wounds and Ulcers, No. 3, 1997.

Severity of Burns of Three Cases

In accordance with the international classifications and standards of burn severity, 3 cases were significantly comparable. Though there are remarkable differences in medical conditions, the results revealed many more differences in therapeutic effects (table 2).
Table 2. Comparison of severity of burns and medical conditions among three cases

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>Sign on admission</th>
<th>Cause of burn</th>
<th>Third-degree BSA</th>
<th>Inhalation injury</th>
<th>Hospital level</th>
<th>Complicated injury</th>
<th>Ward condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry therapy</td>
<td></td>
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<td></td>
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<tr>
<td>M</td>
<td>23</td>
<td>shock</td>
<td>flame</td>
<td>71%</td>
<td>tracheotomy</td>
<td>first class</td>
<td>no</td>
<td>sterilization and isolation</td>
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<tr>
<td>Moist therapy</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>35</td>
<td>shock</td>
<td>flame and hot cement</td>
<td>85%</td>
<td>tracheotomy</td>
<td>secondary class</td>
<td>open multiple metatarsophalangeal fractures</td>
<td>ordinary ward</td>
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<tr>
<td>Composite autograft therapy</td>
<td></td>
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<tr>
<td>F</td>
<td>12</td>
<td>shock</td>
<td>flame</td>
<td>81%</td>
<td>tracheotomy</td>
<td>advanced hospital in USA</td>
<td>open left tibia and fibula fractures</td>
<td>sterilization and isolation</td>
</tr>
</tbody>
</table>

**Compared Parts and Burn Depths**

To accurately and objectively demonstrate the clinical treatment, anterior chest and face with comparable third-degree burns wounds in each case were selected for comparison. The case of composite autograft therapy serves as a reference to show the common ground and contemporary development of surgical excision and skin grafting therapy. Autografts are widely used in the standard surgical burns management and cultured composite autografts (CCA) have recently been used in the United States for skin grafting.

**Standardized Local Treatment of Burns Wounds**

To help facilitate the understanding of a variety of burn treatment techniques, 3 cases were compared at the following three clinical procedures: treatment of burnt skin, healing and closure of wound, and need for reconstruction after wound healing.

**Case 1: Surgical Excision and Skin Grafting Burns Therapy**

**Background Information**

A 23-year-old male was burned when fire burned his cotton clothes ignited by steel residue at his workplace. Immediate antishock management was administrated at the factory clinic. At 4 h postburn, the patient was transferred and arrived at the hospital 7 h 20 min later. Upon arrival, initial assessment revealed that the patient suffered severe burns, including face and both auricles, anterior neck, both hands, chest, abdomen, left thigh and both legs; wound showing leather-like; dendritic vascular embolism. His vital signs included: T: 35.9 °C, P: 44/min, R: 32/min and BP: unmeasurably low. The patient developed hypovolemic shock postburn which was complicated by inhalation injury.

On admission, rapid fluid resuscitation was started to correct shock and tracheotomy was performed to improve ventilation. Escharectomy was then performed on the third-degree wounds of the left forearm and both legs to relieve pressure and improve blood circulation at the extremities. Superior vena cava puncturing and right cardiac floating catheterization were performed to monitor heart function. On day 2 postburn, surgical eschar excision to the underlying fascia and micro-particle autografting was performed on the extremities. On day 6, the patient received eschar excisions on the chest and abdomen, on which evenly holed allograft sheets were applied. Four days after the operation (day 10 postburn) small pieces of split-thickness autografts were placed on these wounds through the openings of the allograft. The patient developed severe *Pseudomonas* septicemia, and became comatose with low body temperature for 1 week. Septicemia was well controlled after intensive care. After that, repeated skin grafting was performed 9 times and most of the wounds healed. On day 43 postburn, corneal ulcer in the left eye occurred and was treated with eye drops and retrobulbar injection. Corresponding measures were taken to prevent stress ulcer, control infection and prevent pulmonary complications. The length of hospitalization was 70 days.
Procedure and Results (fig. 6, 7)

First Step: Treatment of Burned Skin
Dryness and debridement of eschar replaced the burn wound by a surgically induced traumatic wound with neither burnt tissue nor skin tissue.

Second Step: Healing and Closure of Wound

Third Step: Reconstruction after Wound Healing
During a period of 14 months, nine surgical reconstructive operations were performed. However, disablement and disfigurement still presented.

Fig. 6. a Before treatment. b Exposure and dryness of burned skin. c Adopting various methods to enable dryness, dehydration and eschar formation of burned skin. d Excision with electric knife and removal of dead burned skin, subcutaneous tissue together with viable fat layer down to the underlying fascia. e Muscle layer covered by viable deep fascia appeared after excision.

Fig. 7. a Punching holes evenly on prepared allograft sheet. b Stretching the graft as mesh and covering the wound. Four days later, small pieces of split-thickness autografts were placed on the wound through the allograft openings. c Bandaged with adequate dressings. d After 20 days, the allograft was rejected. Autografts survived partially. e Re-autografting of areas where the previous grafting failed. f Even monkey skin was grafted (on day 47 postburn). g Gradual wound healing after multiple grafts. h On the 74th day after injury, the wound was healed but the patient was disabled.
(For legend see page 29.)
Fig. 8. a Before treatment. b Removal of debris and loose dead epidermis. c Biopsy of wound skin for pathological examination confirmed all layers of skin had been destroyed. d Cultivating and scratching skin and relieving eschar with a specially designed ‘plough saw blade’, applying MEBO and treating with burns regenerative therapy. e Removing liquefied necrotic tissue. f Liquefied and discharged necrotic tissue. The newly regenerated skin tissue cells were detected in the subcutaneous tissue by histological examination. g The necrotic tissue was liquefied and discharged. The semiviable injured tissue was revitalized. The newly regenerated islands of epithelial cells appeared upon the granulation tissue, which formed on the surface of the subcutaneous tissue (20th day after injury).
Case 2: Burns Regenerative Medicine and Therapy (BRT with MEBT/MEBO)

Background Information
A 35-year-old male sustained scalds by 1,000 °C hot cement and flame burns secondary to a cement kiln collapse accident at 8:30 p.m. on April 12, 1996. He was admitted to the hospital 4.5 h after injury. Initial assessment showed: (1) burn-blast combined injury; (2) extensive deep burns (85% TBSA); (3) severe inhalation injury; (4) shock; (5) open multiple fractures on both feet.

On admission, the patient was in a critical state and in shock. The extensive deep burns wounds were covered by cement powder. He had inhaled cement and his nasal hairs were singed. He suffered from respiratory abnormalities and hoarseness. Tracheotomy was performed immediately. BRT with MEBT/MEBO treatment and cultivating technique was started on the wound and systemic comprehensive management begun. Histological examination of the wound skin showed third-degree burns. On day 30 postburn, liquefaction and discharge of wound necrotic tissues were finished. On day 49 postburn, newly regenerated skin was present on the wounds. Ten days later, large sections of regenerated skin appeared on the wounds and all wounds had healed completely on day 72 postburn. One year later, follow-up showed the patient free of disablement, capable of independent viability and no need for reconstruction.

Procedure and Results (fig. 8, 9)
First Step: Treatment of Burned Skin
Second Step: Healing and Closure of the Wound
Third Step: Reconstruction after Wound Healing
No need.

Ed. note: In the spirit of brevity, the author has offered photographic documentation of 2 cases only. However, the author has documented hundreds of similar cases and for those who would appreciate reviewing that extensive photographic library, we refer you either to the literature or to www.mebo.com.

Case 3: Surgical Excision and Cultured Composite Autograft Therapy

Background Information
Cultured epithelial autografts (CEA) have been used as an adjunct in the surgical management of extensive thermal burns. Unfortunately, the lack of a dermal matrix makes CEA susceptible to infection, shearing forces and limits their incorporation into the burn wound. A cultured composite autograft (CCA) has been developed recently in which autologous keratinocytes and fibroblasts are surgically harvested from the burns patient’s normal skin. These components are proliferated and then combined to form an epidermal and dermal matrix which grows into confluence and is then applied to the lesion.

Standard wound coverage techniques as well as CCA technology were utilized for successful wound closure in a 12-year-old female with an 81% third-degree burn. After fascial excision and allograft coverage, autografts were placed on her posterior burns and then 7,500 cm² of CCA was placed onto her anterior thorax, abdomen and lower extremities. Sixty percent of the burns was covered with CCA resulting in a success rate of 40%. No evidence of infection was noted, even in areas where CCA failed, although in those areas random epithelialization appeared to occur which then seemed to facilitate autograft placement. Early debridement and allografting followed by conventional autografts and CCA placement may provide an effective skin coverage strategy in patients with extensive deep burns.

Procedure and Results
Disablement and disfigurement. Reconstruction was required. Pictures of the treatment procedure are not available here as copyright is concerned. See Burns 1999;25:771–779 for details.
It is concluded from a comparison of the descriptions in the previous section that burn injuries involving skin only should be treated with BRT with MEBT/MEBO rather than with surgical excision and skin grafting therapy. The latter is only appropriate in the treatment of burns wounds with full-thickness necrosis of subcutaneous tissue together with muscle or deeper burns. To facilitate the clinical performance, the diagnostic principles and clinical indications of various therapies are standardized below.

**Diagnostic Principles of Burns Medical Therapy**

Many textbooks describe the method of diagnosis of burn depth. It is based on naked eye observation and the doctor’s own experience; therefore, it is often difficult to differentiate between full-thickness burns and deep partial-thickness injury. Understandably, therefore, wounds should not be excised since the result is the removal of all skin tissues and superficial fascia. After surgical excision, we see that the prognosis is worse and the mortality and disablement rates are elevated.

In order to standardize the diagnosis of burn depth, the following principles should be followed.

**Principle of Clinical Diagnosis**

First of all, it is necessary to determine whether the burn wound requires surgical excision or not. If the wound demonstrates surviving skin tissue in the deep layer with appearance of exudate within 6 h after injury, then the subcutaneous tissues are viable with functional microcirculation and surgical excision is not required. After treatment with this BRT, white exudates will appear on the wound surface. One notices that the more the exudate, the more superficial the wound. If the wound has no exudate 3 days postburn, surgical operation should be considered. If the wound reveals no hemorrhage of subcutaneous tissue after the fasciotomy, it can be excised. However, this does not apply to the wound where the exudate disappeared after treatment with dry therapy. If such cases occur, there are mistakes in the treatment.

**Pathological Diagnosis**

Pathological diagnosis is used to diagnose the depth of burns wounds without exudate and to determine whether the wounds need to be excised. Wounds with exudate do not need pathological diagnosis. Pathological diagnosis is easy and painless. If there is misdiagnosis of one biopsy sample of a small piece of skin including subcutaneous tissue from the wound, histological examination of the section is performed. If most of the subcutaneous tissue is necrotic, the wound can be excised and treated with skin grafting. If the subcutaneous tissue is still structurally vital, then the wound should not be excised and BRT (MEBT/MEBO) should be applied. Accurate pathological diagnosis based upon scientific investigation is feasible and, when performed correctly, can afford the patient correct diagnosis and optimum prognosis. It is no longer acceptable for the physician to rely upon the naked eye as too many treatment errors could result.

**Indications and Diagnostic Principles of Burns Regenerative Medicine and Therapy**

BRT with MEBT/MEBO is an independent method:

1. For treating superficial second-degree and deep second-degree burns and scald wounds of various causes and in different areas.
2. In coordination with cultivating and relieving techniques, BRT can be used for treating full-thickness dermis burns and scald wounds, provided viable subcutaneous tissue of various causes and different areas are present.
3. For treating burns wounds deep in the muscular layer with diameters of less than 20 cm.
4. For treating wounds at the skin donor site.
5. For treating granulation wounds deep in the muscular layer, for promoting regeneration of granulation tissue in burned bone after debridement, and to create a physiological environment at the receiving site for skin grafting.
6. For treating all kinds of surface wounds.
7. For treating other skin lesions including hemorrhoids, leg ulcers, bedsores, chronic ulcers, infected wounds, chilblains, etc.

**Clinical Application**

Direct application of MEBO – a specially developed topical drug for BRT with MEBT/MEBO – onto the wound surface to a thickness of 0.5–1.0 mm every 4–6 h. Detailed clinical treatment is recommended as follows:
1 For first aid at home (especially in the kitchen): Immediately apply MEBO on the wound to relieve pain, stop bleeding, alleviate injuries and prevent infection in cases of scalds and burns by hot oil, boiling water, or friction burns. The sooner, the better. The consequent treatment should be conducted according to the following specific cases.

2 Treatment for first-degree burns or scalds: Directly smear MEBO onto the wound 2~3 times daily.

3 Treatment for superficial second-degree burns or scalds: Directly smear MEBO onto the wound to a thickness of 0.5~1.0 mm. Renew the ointment every 4~6 h; before doing so gently wipe off any residual ointment and exudates. It usually takes 6~7 days to heal. Blisters, if present, should be punctured and discharged while blister skin should be kept intact in the early stage. No disinfectant, saline or water is required or in fact even allowed except in the case where exogenous toxins remain at the site such as might be the case with chemical burns or other dirty wounds. Patients sustaining moderate or extensive burns should be sent to hospital or a clinic experienced with the BRT treatment protocols.

4 Treatment for deep second-degree burns: Treatment in the early stage is the same as that for superficial second-degree burns. Remove the blister skin on day 5~6 after injury. As the dermis tissues are damaged and white in color, the application of MEBO should be continued on the wound to a thickness of 0.5~1.0 mm every 4 h. White metabolic products resulting from liquefaction of necrotic tissue by the ointment will appear on the wounds (do not misdiagnose this cleansing process as infection). Be sure that the residual ointment and white liquefied products are wiped off gently (do not irritate or debride the tissue) before reapplying MEBO. Allow another 6~7 days for the necrotic tissue to be liquefied and discharged completely, then continue the above treatment using less dosage of MEBO until the wound heals. In the event that the wound is still not healed after 25 days postburn, the diagnosis should be changed to full-thickness degree. In brief, the venerable medical principle of 'primum non nocere' (first do no harm) and of 'no secondary injuries' should be honored during the whole treatment procedure. We accomplish that by: (1) protection of the treated wound in the early stage from further injuries (avoid any measures which may irritate, debride or exacerbate wounds); (2) liquefaction and removal of the necrotic tissue without causing secondary injuries; (3) regeneration and skin repair without causing secondary injuries (any method which may irritate or damage the wounds is not allowed). Patients sustaining moderate and extensive burns should be sent to hospital or a clinic with experience of BRT and MEBT for appropriate treatment.

5 Treatment for second-degree burns: For the small-area burn wound, we recommend cultivating tissue and then preparing the lesion for application of MEBO through gentle loosening of necrotic tissues by scratching with a specially designed device – ‘plough saw blade’ is the appropriate treatment for the deep second-degree burns wounds. For larger burns wounds, the aforementioned method is adopted if the patient’s systemic condition is stable. The principle of ‘no secondary injuries’ should be followed strictly during the treatment. Patient sustaining third-degree burns must be hospitalized at clinics offering care from clinicians experienced in BRT with MEBT/MEBO.

6 In the treatment of small burns wounds occurring in inconveniently exposed body parts, bandaging is recommended. However, dressing changes and renewal of MEBO ointment at a thickness of 2~3 mm every 12 h is recommended. Contrary to the typical dressing change protocol, however, rather than debride the wound beneath the bandage, we recommend that the bandage be gently removed leaving the residual ointment and metabolic products to continue their cleansing activity.

7 Treatment for other superficial trauma wounds including abrasion, friction burns, skin cracking, and stasis ulcers: Treat the ulcer wounds according to the instructions for either superficial or deep second-degree burns, or dress the wounds with MEBO in accordance with the surgical methods. However, any disinfectant, antiseptic or saline is contraindicated as they are both unnecessary and deleterious to wound health.

8 Treatment for hemorrhoids: Directly apply MEBO onto the affected area every morning and evening, or smear MEBO onto the postoperative wound to relieve pain and promote healing.

Burns Surgical Therapy with Excision Followed by Skin Grafting or Cultured Composite Autografting Technique

**Indications and Application**

1 Full-thickness degree burns wounds reaching the lower layer of the subcutaneous tissue of different areas and of different causes.

2 Skin grafting technique is used for treating granulation tissue wounds without epithelial regeneration and for plastic surgery.

3 The hospitals should be qualified to conduct surgery and the operation should be conducted by surgeons specialized in BRT with MEBT/MEBO and/or burns surgery.

Clinical Principles of Burns Regenerative Medicine and Therapy
BRT with MEBT/MEBO is an entirely new burns treatment technique that operates in compliance with the law of life. BRT was invented on the basis of academic thoughts according to the pathogenesis of burns. This new therapy comprises a complete set of theories and techniques for the local and systemic treatment of burns. The profile of this therapy is that through liquefaction and removal of the necrotic tissue, culture and regeneration of residual viable skin, and through repair and replication, burns wounds are finally healed. Wounds are not kept in a dry environment as required in conventional surgical burns therapy, but in a physiological moist environment.

For local treatment, BRT with MEBT/MEBO is associated with MEBO. For systemic treatment, it forms an independent system in compliance with the law of life, including its theory, methodology and therapeutic results. In local treatment, BRT resolved the problems of wound pain and complete regenerative healing of deep second-degree wounds. Through reducing bacterial toxicity by variation, and promoting local resistance to infections, BRT with MEBT/MEBO effectively prevented and controlled wound infections. Through creating a physiologically moist environment and good nutrition supply, BRT with MEBT/MEBO promoted the culture and differentiation of stem cells from the epithelia and relevant tissues in the residual fat layer and finally healed the wounds to full-thickness. Furthermore, exposed bone wounds from burns can also be healed by drilling on the bone in combination with MEBO application, culturing granulation tissue to cover bone and heal the wounds. In systemic treatment, measures of strengthening cardiac function and removing the obstacles in blood supply of renal parenchymal blood vessels are adopted, and then blood volume replacement and comprehensive antishock measures are taken. Accord- ing to the severity of the burn case, effective broad-spectrum antibiotics are applied to control infections at an early stage, but the antibiotics are stopped in order to protect the function of the organs at days 7–10 postburn.

Due to the remarkable effect of this therapy, it has been introduced in Syria, the United Arab Emirates, Thailand, the Republic of Korea, Singapore, etc., and has achieved great clinical success in these countries. Now BRT with MEBT/MEBO is spreading its academic thought as well as its technology to the United States and European countries. At the Congress of the Pan-Arab Association for Burns and Plastic Surgery held in the United Arab Emirates on February 22, 2000, specialists from dozens of countries gave presentations on their research on BRT with MEBT/MEBO.

Intensive Description of Burns Regenerative Therapy with MEBT/MEBO

Concept and Principle of BRT with MEBT/MEBO

Concept

BRT with MEBT/MEBO is a medical treatment which promotes the cell regeneration of residual skin tissue and wound healing by keeping burns wounds in a three-dimensional physiologically moist environment and facilitating the liquefaction and discharge of necrotic skin tissue.

Principle

MEBO, specially invented for BRT with MEBT/MEBO, is an ointment whose base includes a frame structure composed of beeswax which musters a refined botanical oil containing active ingredients.

When applied onto the wounds, the oil sequestered in the beeswax frame is warmed up in contact with body temperature and thus penetrates into the wounds. Four biochemical reactions between MEBO’s active constituents and the burn tissue take place while the nutritional substances are supplied continuously onto the surviving cells in the wounds. The oil then loses its lipophilic nature, seeps out of the drug layer and is discharged from the wound. Fresh MEBO continues to penetrate into the tissue, so that liquefied necrotic skin is removed from the superficial to the interior planes without causing further injury. Simultaneously, this mechanism of action also features a replenishment of the drug in continuous cycles. These cycles ensure active drainage of metabolic waste products including pathogenic bacteria from the injured viable tissue, hence the caveat to not apply topical sterilizing agents. Tissue fluid in the wound supplies the requisite physiologically moist environment. The cycle also ensures continuous supply of indispensable nutritional substrates and enzymes to the recuperating wound tissue. Furthermore, the frame structure of MEBO base effectively insulates and isolates the vulnerable wound from the external environment by forming a viscous dressing. A remarkable characteristic of this ‘dressing’ is that it prevents foreign external contaminants from penetrating while allowing for the exodus of metabolic debris products resulting from the regeneration of the wounded tissue. In a metabolic sense, the MEBO allows the wound to ‘breathe’ in a manner very similar to that of normal skin.
Therapeutic Effects of Moist-Exposed Burns Ointment (MEBO)

Under the direction of qualified BRT with MEBT/MEBO therapists, MEBO has the following therapeutic effects:

1. Variation of pathogenic microorganism and reduction in bacterial toxicity.
2. Effectively killing pain by protecting nerve endings and relaxing pilorum arrectors.
3. Anti-inflammatory by the effects of \( \beta \)-sitosterol and other ingredients.
4. Made of nutrient food, MEBO may protect cells by increasing the tension in the cell membrane and help dying cells convert into vigorous normal ones.
5. With the co-ordination of BRT with MEBT/MEBO, MEBO develops a physiologically moist environment, favorable to the regeneration and repair of tissue structures. Thus, it is effective for reducing scar formation, enhancing the power of self-repairing of wounds and promoting the regeneration and differentiation of stem cells from residual epithelial tissue, vascular plexus and fibrous tissue in the fat layer to regenerate skin.

Clinical Application of BRT with MEBT/MEBO

Treatment Conditions

Strictly sterilized conditions are not emphasized. Debridement using any disinfectant, saline or water is forbidden. Small burns can be dealt with at home with MEBO. Moderate and minor burns encountered in the battlefield can also be treated with BRT with MEBT/MEBO. For treating large burns, the room should be kept at a temperature of 30–34°C and first-aid apparatuses or devices should be equipped with it.

General Application

Directly smear MEBO onto the wounds with a thickness of 1 mm. At the beginning, no debridement is required except for chemical burns or dirty wounds. Renew MEBO every 3–4 h, before which wiping off the residual ointment and liquefaction products with gauze or tissue paper (gentle and careful renewal is demanded to avoid pains and bleeding). For wounds with blisters, be sure to preserve the blister skin, directly apply MEBO until the blister skin is removed 5 days later. For deep second-degree burns, after applying MEBO, dermal tissue in the necrotic layer begins to liquefy on day 7 postburn. Renew MEBO and wipe off the liquefaction product timely. After the complete discharge of necrotic tissue, apply less MEBO and renew every 4–6 h till the wounds heal. For third-degree burns, treatment with a special debridement technique can be applied coordinately.

Special Application

For treating not easily exposed small burns wounds, apply MEBO with a thickness of 2–3 mm, then apply a decompression bandage using dry gauze. Before changing the dressing every 12 h, gently remove the drug sediment and liquefied necrotic tissue. For treating traumatic, ulcerative and operative wounds, 1–2 layers of gauze impregnated with MEBO also could be used.

Principle of Systemic Treatment

Burn is a systemic disease caused by thermal injury. The changes in topical treatment directly affect the systemic pathophysiological status. BRT with MEBT/MEBO systemic treatment is essentially different from conventional surgical dry therapy. While using BRT with MEBT/MEBO, the protocol of surgical dry therapy is forbidden. Two principles should be followed in this treatment on extensive deep burns: (1) In the early stage, a comprehensive antishock treatment principle is applied, which involves enhancing cardiac function, protecting renal function and supplementing effective blood volume according to the vital signs. (2) In the middle and later stages, expectant treatment is applied, with a protocol of keeping a water-electrolyte balance, nutritional support and maintaining a comprehensive balance. In the anti-infection treatment, a large dose of strong and powerful broad-spectrum antibiotics should be used in the early stage for 7–10 days and then withdrawn immediately, in order to protect and enhance the anti-infective function of the internal organs. For nutritional supporting treatment, a protocol of oral administration is desired. Others are dealt with according to the case.

Clinical Treatment

Treatment for First-Degree Burns

The clinical signs of first-degree burns include skin redness, slight swelling and pain. Immediate application of MEBO may relieve the pain. The erythema gradually diminishes as MEBO is warmed in situ and absorbed through the skin. At 12 h postburn, the skin may return to normal. For burns with edema, the epidermis is partially destroyed, the pain may be relieved more slowly and the wounds heal in 2–4 days when the superficial stratum corneum exfoliates.
Treatment for Superficial Second-Degree Burns

According to the pathogenic process of superficial second-degree burns, the treatment can be carried out in two stages.

First Stage. Treatment in the early stage – the period from emergency treatment postburn to the end of shock period (within 3–4 days after injury). The clinical signs in this stage include pain, edema, blisters, and a great amount of blood plasma exudated from the site where blister skin exfoliates. According to the principle of BRT with MEBT/MEBO, apply MEBT/MEBO directly all over the wound, puncture the blister (if present) on the lower part to discharge liquid. Do not remove the blister skin, directly apply MEBT/MEBO on the blister skin 3–4 times daily. With the application of MEBT/MEBO, a layer of thin soft membrane forms upon the wound free of blister skin, the membrane still allows the exudates to ooze through, and then it gradually thickens. Do not remove the soft membrane, since it can substitute the skin role of fulfilling breathing and protection. Continue MEBT/MEBO application directed by BRT.

Second Stage. It is the wound-repairing period when the shock stage ends and the residual viable epidermis tissue begins to regenerate and recover, usually lasting 3–4 days. In this period, the basal cells in the epidermis recover to form a granular layer and thus promote wound healing. In clinical treatment of BRT with MEBT/MEBO, after the edema period, the blister skin loosens and exfoliates, and the thin soft membrane formed on the wounds also loosens and exfoliates. Simply cleaning away the blister skin and soft membrane is first desired, then continue the application of MEBT/MEBO to protect the regenerated wounds till healing. During the whole treatment, neither pain nor further injury to wounds is allowed. The correct application method helps the wounds heal without causing any infection, pain, scar formation or hyperpigmentation. Generally, superficial second-degree wounds treated with BRT with MEBT/MEBO heal within 6–8 days and the skin recovers completely to its normal physiological status within 3 months.

Treatment for Deep Second-Degree Burns

According to pathological and clinical manifestations, deep second-degree burns can be divided into injury on the dermal papillary layer and injury on the reticular layer, or simply referred to as deep second-degree superficial (DIIS) and deep second-degree deep (DIID) burns.

DIIS

Clinical signs include wound pain, extensive blisters, wound without blister skin becoming red and white, the superficial dermal tissue is necrotic and turns white, the surviving deep dermis tissue is red, while under pressure it turns white and soon returns to red after release of pressure (DIID burns wounds respond more slowly). The exudates of the wounds are only less than those of superficial second-degree burns.

BRT with MEBT/MEBO treatment and clinical manifestation: It is a four-period process: firstly, treatment in the early stage (shock period), same as that for superficial second-degree burns; secondly, liquefaction and rejection period of necrotic dermal tissue (rejection period); thirdly, regeneration and recovery period, and, fourthly, rehabilitation period of skin physiological function after wound healing.

First Period. The treatment of the first period is the same as that for superficial second-degree burns, emphasizing on wound protection. A thin layer of soft membrane may appear on the wound free of putrid or blistered skin. The next treatment period starts on day 4–5 postburn when the wound edema diminishes gradually.

Second Period. Clean away the putrid skin, blistered skin or thin soft membrane in the same way as dealing with superficial second-degree burns. Continue the application of MEBO. Gradually, the necrotic layer of wound surface begins to liquefy from the superficialies to the interior and produces white liquefied products floating over the wound surface. Usually at 3–4 h after application of MEBO, the wound is totally covered with whitish liquefied products, indicating that MEBO is consumed completely. The liquefaction products must be cleaned away before the renewal of MEBO. Another 3–4 h later, the renewed MEBO is consumed again when the liquefaction products float over the wound. Clean the liquefaction products, renew MEBO again and keep the clean-renew-clean process going until the necrotic tissues are entirely liquefied and discharged. This process generally occurs 5–15 days postburn. Patients with large-area burns are urged to turn over during drug renewal.

Third Period. After the second period treatment, the chestnut-like residual dermis tissues, millet-sized, are exposed on the basal layer of the wound. Continue MEBO with less thickness directed under BRT with MEBT/MEBO and renew every 4–5 h (every 6–8 h at night). Covered and protected by MEBO, the residual dermal tissue reconstructs and regenerates. Once dermis tissue regenerates to smooth skin, less irritation to the wound is allowed. Again reduce dosage and renewing times as long as the wound is not dry, but crust formation is forbidden, i.e. not only prevent wounds from being macerated by MEBO, but also avoid the wounds becoming dry and getting covered by a crust. Duly keep the normal skin around the wound clean. For large-area burn patients, do as in the second period by helping them turn over regularly on the basis of drug change intervals. The pressured parts of the body still need MEBO protection till the wounds heal. This period occurs 15–20 days postburn.
**Fourth Period.** Although the wound heals after the third stage, the functions of the newly healed skin still need to rehabilitate completely. The epidermis requires further physiological adjustment and metabolism; the sebaceous glands need compensatory metabolism; the excretory duct of the sweat gland is not yet clear; the functions of pigment cells are unable to meet the requirements of normal skin. Under these circumstances, MEBO is still necessary to be used as a skin-care oil for another 10–15 days. Or apply newly developed MEBO series products – MEBO Cleansing Cream to promote quicker recovery of skin function, or apply MEBO Itch Relieving Cream to stop itching.

**DIID**

The clinical signs of deep second-degree superficial burns, except that DIID has more serious injuries and more serious response during the liquefying period and therefore the reconstruction and regeneration of wounds become more complicated. The clinical treatment for deep second-degree burns also can be divided into four periods.

**First Period.** Clinical signs – no extensive blisters, epidermis entirely destroyed and adherent to injured dermis, the wounds free of putrid skin are no longer sensitive to pain, the wounds are white, with little exudate. Some of the wounds may be red alternating with white, but the color-changing response to pressure is very slow. This period begins from the first day of burn through the 7th day postburn. During this period, simply apply MEBO to protect the wound.

**Second Period.** From day 7 to day 20 postburn, clear away all adhering substances to expose necrotic dermis and apply BRT with MEBT/MEBO immediately. For small wounds, simply use this treatment to liquefy and discharge the necrotic layer. For large burns, simple debridement should be used coordinately. The necrotic layer is so deep that the wound liquefying may be incomplete and cause lumps exfoliation of necrotic tissues, which need to be cut with surgical scissors and removed. Attention should be paid to keep a certain distance between the surviving viable tissue and the cutting. Any further damage to the surviving viable tissue such as bleeding (which may cause infection) should be absolutely avoided. Simple debridement can be adopted according to the condition of the wounds. When the necrotic layer is almost completely liquefied, clean away the liquefaction products in time to ensure that the non-smooth survival tissue is kept in a MEBO environment, but not in an environment filled with liquefaction products.

**Third Period.** The period of reconstruction and regeneration of residual dermis tissue. As little residual dermis tissue is left and the dermis frame is fundamentally destroyed, correct BRT with MEBT/MEBO is quite vital in this period. The reconstruction of dermis tissue involves three parts: (a) the reconstruction of vascular tree; (b) the reconstruction of fibrous tissue dependent on vascular tree; (c) the regeneration of skin appendages, gland tissue, formation of excretory ducts, and formation of skin tissue. Any careless injuries and pressure to the wound are forbidden. This period usually happens on days 20–28 postburn.

**Fourth Period.** Aiming at helping the healed skin return to normal, the treatment in this period varies according to burns severity and skill in the treatment. The severe injuries to skin and the factors affecting the skin during reconstruction make the newly healed skin quite different from normal skin in structure, appearance and function. So the rehabilitation is very important, including two aspects: ‘protective therapy for healed skin’ and ‘functional exercise’. The former is accomplished by adjusting the structure of newly regeneration skin tissue with the application of MEBO Scar Lotion, by adjusting the function with MEBO Cleansing Cream, and by killing itch with MEBO Itching Reliever just after the wounds heal.

**Treatment for Third-Degree Burns**

Third-degree burns are also an indication for BRT with MEBT/MEBO. As the epidermis and dermis of third-degree burn wound are totally destroyed, it is quite difficult to cure third-degree burns. The conventional medical science for burns is convinced that third-degree wounds cannot heal spontaneously, and the only solution is to use surgical skin grafting to close them. The clinical study and administration of BRT with MEBT/MEBO for curing third-degree burns wounds will be described in detail thereafter. The following is just a brief description of the principle and method of this treatment.

**Principle.** Decompression of the deep tissues to relieve any pressure caused by the necrotic layer is of critical importance; protect the necrotic full-thickness skin; promote stem cells containing the skin information in subcutaneous tissue to regenerate and differentiate to form a skin island; culture the newly regenerated skin island while liquefying and discharging the necrotic dermis; promote the skin island to spread and cover subcutaneous tissue to form new skin; and help third-degree burns wounds heal spontaneously. For third-degree wounds injured down to the muscle layer, excise most of the necrotic tissue by surgical operation, liquefy and discharge the rest of the necrotic layer with BRT with MEBT/MEBO, upon which culture granulation tissue, then plant skin cells till the wound closes and heals. For wounds with bone exposed, clean away the exposed outer soft tissue, drill holes on the bone surface with a bone drill at intervals of 0.5–1 cm, deep into medullary cavity of bone until bleeding. Apply MEBO to cover the wounds, and culture and support the growth of granula-
tion tissue from the holes. When the granulation tissue spreads to cover the bone surface, skin grafting can be performed to close the wound, or the wound heals by migration of epithelial cells from the wound edges.

The necrotic tissue of third-degree burns should be decompressed by cutting both horizontally and vertically at a 1 mm tooth distance and depth with a specially designed method: ‘plough saw blade’. Then apply MEBO for protection and clean away the exfoliated or liquefied tissue.

### Systemic Comprehensive Treatment with BRT with MEBT/MEBO

**Principles of Initial Treatment**

**Principles of First Aid**

1. Keep the patient in a horizontal supine position with slight elevation of the head. Turning over is contraindicated. Expectant administration.
2. Application of any topical drug that may be harmful or irritative to burns wounds is contraindicated. Adopt measures to relieve pain and protect burns wounds as soon as possible.
3. Avoid changes of patient body temperature which consume vital energy striving instead to keep the patient warm as much as possible.
4. If appropriate and well-tolerated, cardiotonic and sedative medications may be given through intramuscular injection or intravenous infusion.
5. If the wound is deemed appropriate for treatment with BRT with MEBT/MEBO, smear MEBO directly onto the wound. Once the wound is thus protected, cover the wound with adequate dressing and transfer the patient immediately to the nearest hospital for further treatment.

**Principles of Emergent Treatment and Nursing**

1. Treatment condition: a clean or sterile (which is not absolutely necessary) environment is required. Temperature around the wound surface should be kept at 34–38°C.
2. Early wound care: any feculency and dirt should be cleared away. Do not use any method or topical drug that may cause further injury to the wound or promote tissue hydrolysis.
3. Principle of initial nursing: do not turn the patient over. Alternately lie on one side or alternately change pressure at various body parts.
4. If BRT with MEBT/MEBO treatment is adopted, wound debridement with MEBO and topical application of MEBO should be performed for wound care.

### Wound Debridement with MEBO

Cover the wound with MEBO immediately after injury regardless of the presence of dirt or chemicals. Two or three hours later, gently clear away the feculency and dirt together with residual MEBO before the renewal of MEBO. This method is applicable for first-aid treatment as well as wound debridement after hospitalization when daily cleansing is appropriate.

**Topical Application of MEBO**

Smear MEBO onto the wound at a thickness of 0.5–1 mm immediately after wound cleansing. Gently wipe off liquefied products before renewing MEBO every 4–6 h. Renewing intervals could be increased to every 6–8 h during the wound repair period.

### Antishock Therapy

The author considers that in the antishock therapy postburn, it is more important to protect and recover the functions and structures of internal organs than to supplement blood volume only. The principles of the treatment are as follows:

**Protection and Enhancement of Cardiac Function**

We propose that a lot of protein degradation products released from burned skin tissue could be absorbed into the blood circulation, and could further inhibit and decrease cardiac function, thus inducing cardiogenic shock. Therefore, severely burned patients (TBSA >50% and/or third-degree >10%) should be routinely injected intravenously with cedilanid (lanatoside C) 0.2 mg in 25–50% GS 50 ml q.d. after injury or admission. Then, the amount and frequency of cedilanid should be regulated according to the changes in heart rate and peripheral circulation. 48 h postinjury, the administration of cedilanid should be stopped unless the patient is still suffering from abnormal cardiac function, in which case cedilanid should be applied until the symptoms disappear. If symptoms of heart failure arise during the course of treatment, the patient should be treated with 0.2–0.4 mg cedilanid immediately. One treatment is frequently sufficient.

**Protection of Renal Function**

After massive burns, one of the main complications in the shock stage is renal dysfunction that is caused firstly by microvascular spasm of the renal parenchyma and renal ischemia. It is also the major etiology of renal failure. Therefore, treatment of renal function is the crux of antishock and comprehensive treatment to relieve the microvessels in the renal parenchyma. This needs to be addressed as early as possible. The principles of renal treatment are follows: After injury or immediately upon admission, severely burned patients routinely require an intravenous drip with 1% procaine 100 ml, caffeine
sodiobenzoate 0.5 g, vitamin C 1.0 g, 25% GS 100–200 ml, q.d. or b.i.d.–t.i.d. depending upon the degree of shock and the amount that urine production is reduced. This intravenous drip should be continued in patients with anuria until urination is recovered. The routine treatment plan may be maintained until wound healing.

Supplement Blood Volume
After massive burns, a great deal of intravascular fluid exudes toward the wound surface and tissue space, which leads to the reduction in effective blood volume resulting in hypovolemic shock. Therefore, during the above treatment course, the blood volume should be monitored and replenished as needed. In particular, attention must be paid to avoid massive intravenous infusion blindly without precise attention being paid to cardiac and renal functions, as well as other excretory functions. The principle is as follows:

Compositions of Fluid Infusion. The ratio of crystalloid solution (normal saline or 5% GNS) to colloid solution should be 1:1. The colloid solution should be composed of 3/4 parts of plasma and 1/4 part of whole blood when the condition allows, otherwise 1/2 part of plasma and 1/2 part of plasma substitute can be used.

Amount of Fluid Infusion. According to the basic principles of surgery, the amount of fluid infusion should be equal to the amount of body deficiency. In the shock stage of massive burns patients (during 48–72 h after injury), we offer a more detailed formula:

\[
\text{Total amount of fluid infusion (ml/day)} = \left[ \frac{\text{physiological water needs (5\% GS 2,000–2,500 ml)}}{1 \text{ (ml/kg)} \times \text{TBBA\% (2nd to 3rd degree)}} \times \text{body weight (kg)} \times 100\% \right] + \frac{\text{hourly urine volume (ml)/body weight (kg)} \times 1 \text{ (ml/kg)}}
\]

Speed of Fluid Infusion. After extensive burns, the trauma stresses the heart, kidney and brain tissue, making their functions vulnerable. During the first 24 h postburn, 1/2 of total fluid amount should be infused in the first 8 h, another 1/2 should be infused over the next 16 h evenly again, with regard to cardiac and renal functions. During the second 24 h postburn, all of the fluid should be infused at a uniform speed. During the third 24 h after injury, the amount and speed of fluid infusion must be determined strictly in the light of the symptoms of shock and the amount of urine. When the symptoms of shock are improved markedly or disappeared and the amount of urine is >1 ml/h-kg, the speed of fluid infusion should be decreased and the fluid amount should be reduced by 1/3.

Nursing Care in Shock Stage
After severe burns, the onset of shock would be related to thermal injury as well as adequate nursing care. The burns patient can hardly withstand any further stress due to the already severely compromised condition of all internal organs. Thus, nursing care constitutes a critical service in supporting as stress-free a recovery period as possible. Nurses should:

a. Directly apply MEBO on the wound surface immediately, isolate the wound from contacting with air, relieve wound pain, protect the wound from any irritative damage, resist the tendency to debride the wound.

b. Apply air conditioner or bedstead and sheeting to maintain room temperature at 30–34°C, and prevent fluctuation in room temperature.

c. Smooth out the bed sheet and dressing, protect the wound from any compression, change dressing and MEBO every 12 h gently, while keeping the patient in the horizontal supine position. Again, turning the patient over is contraindicated.

d. Control the speed of fluid infusion such that it flows at a constant rate remembering that rapid fluctuation of infusion speed is forbidden.

Anti-Infection Therapy
We have observed that there are two pathogenic types of postburn infection. One has an endogenous pathogenesis, while the other is exogenous. The endogenous infection is similar, but different from the primary infection typically noted by surgical burns therapists. This consists of subclinical infection in that the possibility of postburn infection always remains a potential reaction to burns. The latter infection consists of postburn infection caused by all exogenous sources and factors including iatrogenic burns.

Principles of Anti-Infection Treatment

Principled Scheme of Routine Treatment. Burned patients with TBSA <30% generally do not need to be treated with systemic antibiotics. All the burned patients with TBSA >30% (TBSA >10% in children) must be treated with systemic anti-infection drugs routinely whether infection occurred or not. The principle is: (1) To apply one or more powerful broad-spectrum i.v. or i.m. antibiotic as early as possible after injury until the 5th to 7th day for massive deep second-degree burns and the 7th to 10th day for massive third-degree burns. (2) The more extensive TBSA and deeper the wounds, the more powerful and broad-spectrum antibiotics are required. (3) Regardless of the patient’s condition, stop applying all antibiotics at the aforementioned time.

Principle of Expectant Anti-Infection Treatment. In order to prevent and treat secondary and routine infection, a prophylactic antibiotic protocol should be administrated. However, it is very important to rule out inflammatory and noninfectious etiologies initially as antibiotics would be contraindicated if infection is not problematic.
Remember that some patients with fever and increased heart rate may not be infected. After postburn routine treatment, the burned body struggles to repair and re-equilibrate a myriad of physiological functions and unnecessary antibiotic administration at this time would interfere with native resistance functions. Indications for antibiotic use: Three clinical manifestations must occur simultaneously: body temperature $>39.5^\circ\text{C}$ or $<36.0^\circ\text{C}$; heart rate $>140/\text{min}$; toxic granules in neutrophil leukocytes. Clinical vigilance is required.

Profile of Expectant Anti-Infection Treatment

One single dose of one or more powerful broad-spectrum renal-sparing antibiotics should be applied. It may be repeated until examination reveals that the neutrophilic toxic granules are no longer present. The patients should be examined for secondary infection sites and treated appropriately. The failure to control infections is commonly due to occult foci of infection within internal organs or under the wound surface. The patient recovering from general asthenia should be offered fresh blood infusions to aid in the regulation of internal balance. Abuse of antibiotics without indications of infection is contraindicated.

Balance-Regulating Treatment at the Stage of Wound Liquefaction

After shock stage is addressed, the burn wound enters the rejection stage. For deep second-degree burns wounds, injured and necrotic tissue starts to be rejected from residual viable tissue at approximately the 5th day postburn. This rejection reaction continues until all the necrotic tissue is discharged. The role of the physician and nursing staff at this time is to not interfere with this natural cleansing and regenerative process. During this stage, internal organs and many physiologic systems which had been stressed are particularly vulnerable to rejection which can then lead to single or multiple organ failure. Therefore, this is the most critical stage of the BRT (MEBT/MEBO) and requires extreme vigilance. Based on our clinical experience of many years, we consider that the key to treatment in this stage is to enhance and restore the systemic vitality and comprehensive balance, without which any monotherapy would only have a suboptimal chance of success. This therapeutic measure is termed ‘balance-regulating treatment’, and its protocol includes the following.

Wound Drainage

During the stage of wound liquefaction, as necrotic skin tissue is liquefied from the superficial to the deeper layer (under the effect of MEBO), it is very important to clean up liquefied materials prior to successive applications. Remember, there are differences between clearance of MEBT/MEBO liquefied materials and surgical debridement. After treatment with MEBO, the changes in burns wounds should be supervised continuously. When MEBO on the wound surface completely changes into a whitish liquefied material, this layer should be wiped off or cleaned with a soft dry absorbent gauze or tissue paper at once. When the necrotic skin tissue separates into pieces without liquefying completely, it should be cut away gently from the wound (not debridement) and then MEBO ointment should be reapplied immediately. Unlike debridement, the RBT patient typically feels no pain during the cleaning process. If he does, it is an indication that the cleaning is too aggressive. Any harmful tissue damage should be strictly prohibited. In order to ensure for correct clinical practice, there are six operative rules for this treatment, i.e. the burn wound must not hurt, there should be no fresh bleeding, no maceration, no desiccation, no liquefied materials, and no lack of applied MEBO.

Treatment of Body Fluid Equilibrium

After extensive burns, large amounts of body fluid exude toward the wound surface and evaporate. We know that this body fluid plays a vital role in systemic reactions that result from traumatic stress. Therefore, it is an important procedure of the comprehensive treatment to maintain body fluid equilibrium. The principles of this treatment are as follows: The amount of fluid infusion for the burns patients suffering from TBSA $>50\%$ should be initially b.i.d. in response to physiologic demand. Subsequently, the amount of fluid infusion should be modified in response to changes of urine volume and shock symptoms. The amount of peroral fluid should be calculated together with intake volume per day. The range of increase or decrease in fluid infusion should not be greater than 10% of total volume. The compositions of fluid infusion and the regulations of water-electrolyte balance conform with the basic principles of surgical treatment. In this treatment stage, the fluid amount of nutritional support treatment should be included into the total fluid volume. Note that after fluid infusion, the quantitative and qualitative changes of urine should be carefully monitored and treated prophylactically.

Regulation of Body Temperature

During the stage of wound liquefaction, the basal metabolism rate upregulates as an adaptive mechanism including an increase in catabolism to supply energy for regenerative needs. At the same time, the burns patients frequently show hyperpyrexia because of an interference in feedback regulation of burned skin to the thermoregulatory center. The clinical treatment is as follows: firstly, make the diagnosis of adaptive hyperthermia clear and, secondly, do not misdiagnose high fever as infection.
Treat accordingly. The diagnostic indexes of this regulatory imbalance of body temperature are as follows: (1) body temperature $> 39.5^\circ C$ and which fluctuates irregularly suggests no indication of infection; (2) no relationship between symptoms and high fever (body temperature is high, but the patient feels as 'usual') suggests no infection; (3) no abnormal signs in the wound suggests no localized infection. Rather than inappropriately relying upon the antipyretic effect of antibiotics, the physician should avail himself of simple physical cooling (for example, fanning the patient and the wound surface), as well as clearing away the liquefied materials, thereby facilitating heat release from the wound. If physical cooling produces little effect, especially in pediatric burns, a small dose of glucocorticoid should be applied, being cautious to prevent hemorrhage of digestive tract ulceration.

**Trilogy Syndrome of Heart Rate, Respiration and Body Temperature**

After a massive burn and during the stage of wound liquefaction, we see an adaptive increase in heart rate of $>120/min$, respiratory rate of $>30/min$, and body temperature of $>39.5^\circ C$. The symptoms are similar to sepsis in many ways, e.g. shortness of breath, confusion, marked hypoxia, and a murky gray or brown discoloration of the wound. This trilogy syndrome of heart rate, respiration and body temperature is often due to tiredness, mental stress and insomnia. Most of the patients have a history of the syndrome and are in a calm state of before the onset of the syndrome. It is considered preliminarily that the mechanism of this syndrome is myocardial strain, and that the reaction of heart failure resulted from serious insomnia and mental fatigue. The principle of treatment is immediate enhancement of cardiac function and intravenous injection of lanatoside C (0.2–0.4 mg in 25–50% GS 50–100 ml). If the trilogy is accurately identified, the symptoms should disappear immediately upon treatment. The possibility of concurrent infection should be entertained if the above-mentioned treatment was not very effective. In clinical practice, many patients suffering from this trilogy syndrome are misdiagnosed with sepsis, and treated inappropriately with massive antibiotic intravenous infusion. This is unfortunate and contraindicated as the window of opportunity for optimizing regeneration has been lost, and these patients die of cardiac failure though the cause of death would be mistakenly attributed to sepsis.

**Protective Treatment of Multiple Organs’ Function**

In the stage of wound liquefaction, heart, lungs, kidneys, liver, brain, gastrointestinal tract and other organs are experiencing posttraumatic stress, global hypofunction and setting the stage for their individualized restoration. Any treatment increasing the metabolic burden on these organs constitutes an additional stress. Therefore, it is necessary to create a favorable physiological environment for the organ’s recovery. The methods for creating this environment are exactly the principles of protective treatment of multiple organs’ functions: (1) The consequences of all treatment protocols on internal organs in the shock stage should be re-examined. (2) Stop applying any drug that is harmful to the healthy function of heart, lungs, kidneys, liver, digestive tract and other organs. (3) Stop applying any drug that is detrimental to the synthesis of protein. (4) To ensure an adequate energy supplement, reduce all factors predisposing to catabolism. (5) To apply some drugs temporarily which can protect the functions of liver, kidneys, digestive tract and other organs.

**Nutritional Support Treatment**

Extensive burns patients must be treated continually with nutritional support from the transition from shock stage until full rehabilitation. The principles of nutritional support treatment with BRT (MEBT/MEBO) are basically the same as the principle of supporting treatment of traumatic surgery. However, the supplementary amounts of total energy and protein for the former are significantly higher and of longer duration as compared with that of general traumatic patients. In clinical practice, we recommend nutritional support from the 4th to the 8th day after injury since protein is constantly required for repair and rehabilitation. After the shock stage, it is optimal to take food by mouth as soon as possible as nutrition supply through the digestive tract is encouraged. The principles of treatment are as follows:

1. Daily caloric requirement of burned patient (kcal) = $24 \times \text{body weight (kg)} + 40 \times \text{TBSA\%}$
2. Glucose should provide between 55 and 60% of the total calories, fat between 20 and 30%, and protein between 15 and 20%.
3. The ratio of nitrogen to caloric should be 1:150–200.

In addition to the above supplementation, burned patients should take protein-rich foods and vegetables as liberally as possible.

**Comprehensive Expectant Therapy**

For extensive burns patients, the comprehensive treatment should include attention to multiple sites, e.g. cardiovascular system, respiratory system, digestive system, urogenital system, nervous system, endocrine system, and not only attend to the healing of local wounds. In clinical practice, there are no fixed models and schemes of comprehensive expectant treatment. The doctors must observe and analyze the changes of burned patients’ conditions carefully and work out a medical scheme individually.