Clinical Application and Efficacy of MEBT/MEBO in Treating Deep Large Area Burns
(A Report of 51 Cases)

Li Chuanji¹, Hu Jianwu¹, Yan Hongmei¹, Li Rongchun²

1. The First People's Hospital in Shizuishan city, Ningxia Province (753200)
2. The Hospital of Ningxia Chemical Co.ltd

[Abstract] Fifty-one cases of deep large area burn were treated with MEBT/MEBO. The largest burn area was 96%, average burn area 60.78%, average third degree burn area 36.47%. Among them, 23 cases were burned by fire, accounted for 45.09%; 24 cases scalded, accounted for 47.05% and 4 cases burned by chemicals, accounted for 7.84%. A comprehensive analysis of the pathophysiological changes during shock stage, wound treating principle at the early, middle and later stages and changes in blood biochemical indexes was made. All the patients were treated with MEBT/MEBO, except for one case who could not persevere in proper MEBT/MEBO treatment and died from MSOF complicated with digestive tract hemorrhage. All the 50 cases were cured. The curative rate was 98.03%. Among them 3 cases had wound healed by small area skin grafting (less than 10%), 47 cases healed spontaneously. Average healing time was 33.27 days. None of them had disablement and severe dysfunction. This result proved that MEBT/MEBO is efficacious in treating burns with any area and depth. It is important to apply this technique in a proper way. Usually no skin grafting was needed for deep degree burn. The incidence of complications, the disablement rate and scar forming rate were reduced and curative rate was increased.

[Key words] Burn; MEBT/MEBO; Clinical application; Efficacy

The application of MEBT/MEBO in treating large area burns avoided scar-cutting and grafting, decreased the pain incurred by continuous operations and chances of disability, increased the cure rate. The 51 cases of large area burns over 50% treated by our department from 1994-1997 were summarized as follows, since the data were complete.

Clinical data

1. General data

The burns depth and area of 51 cases were classified according to the principles advocated by professor Xu. Among 51 cases, 46 male cases accounted for 90.20% and 5 female cases accounted for 9.80%. Eleven pediatric patients below 12-year-old accounted for 21.57%, 34 cases between 16 and 30 accounted for 66.67%, 6 cases over 31 accounted for 11.76%, and the average age was 22.2 years old. The largest burn area was 96%, the average burn area 60.78%, the average 3rd degree burn area 36.47%, 1 death case accounted for 1.96% and the other cured 50 cases accounted for 98.03%. Causes of injury: 24 cases burned by boiled water or hot and high pressure vapor accounted for 47.05%, 4 cases burned by chemicals
accounted for 7.84%, and 23 cases burned by fire accounted for 45.09%. The classifications of burns area and 3rd degree burns area were summarized in as table 1 and 2.

Table 1 The classification of burns area of 51 large area burns cases (%)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Area</th>
<th>50~</th>
<th>70~</th>
<th>80~</th>
<th>over 90</th>
<th>Average area</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>cases%</td>
<td>24</td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>61.38</td>
<td>46</td>
</tr>
<tr>
<td>female</td>
<td>cases%</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>56</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 2 The classification of 3rd degree burns area of 51 large area burns cases (%)

<table>
<thead>
<tr>
<th>cases %</th>
<th>30~</th>
<th>40~</th>
<th>50~</th>
<th>over 60</th>
<th>Average 3rd area</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>50.98</td>
<td>19</td>
<td>4</td>
<td>2</td>
<td>36.47</td>
<td>51</td>
</tr>
</tbody>
</table>

2. Treatments

1) Treatment during shock stage:

Shock prevention was important in large area burns patients. If the patient already had shock, correction should be applied immediately. The clinical symptoms of burns shock were similar to that of hemorrhagic shock. The symptoms in the early stage were as follows: thirst, dysphoria, paleness, cold limbs, weak pulse, high heartbeat rate, little gradient pressure and little urine. There were 48 cases of shock in the 51 cases, accounting for 94.11%. Living through shock period smoothly indicated that the patient was cured properly after burns. Fluid was supplied timely in the lowest limit according to the rate of lost in order to satisfy the basic need of effective circulation and ensure the basic infusion in histiocyte and to guarantee the vital life signs steady. The principle and method of fluid replenishment were based on pathology and physiology of burns. The choice, volume and rate of supplying were based on the kind, volume and rate of fluid lost. Now different scholars had different ideas in supplying method. According to our experience of fluid replenishment to 51 large area burns cases, the fluid replenishment method of 600 burn cases with shock summarized in 60s’ by the burns department in Shanghai Ruijin hospital (Guangci Hospital previously) was more reasonable. Since MEBT/MEBO created a physiological moisten environment in the wounds, the fluid replenishment volume could be a little below this standard.

2) Main custody indexes

1. The urine volume: Under normal renal function and without diuretic, adults should had 50~60 ml urine per hour, children should had 20~30 ml and infants should had 10~15 ml. 2. Mental state: clear mind, quiet and even breath. 3. Peripheral
circulation: warm in the end of limbs, good conditions in capillary vessels and powerful pulse (including dorsal artery in foot and radial artery) 4. Heartbeat rate: adults below 120 times per minute and children below 140 times per minute. 5.Blood pressure: for adults contractive pressure should be below 90 mmHg and the difference of pulse pressure should above 20 mmHg. This indicated that the supplement was enough if achieved the above standards. The rate of fluid supplying should be adjusted timely if under or above this standard. To the extraordinary deep burns with TBSA over 80%, more custody indexes should be tested. (such as central venous pressure, blood gas analysis, serum sodium, pulmonary arterial wedge pressure and pulmonary capillary pressure).

3) Wounds treatment

1. Early ploughing and debridement should be carried out if the conditions allowed. When applying MEBO to treat cell shock, avoid washing and brushing unduly during debridement. Early ploughing should be applied in treating 3rd degree scars in 24 hours since they were brittle. After 24 hours the scars became soft thus ploughing became difficult. After 48 hours when the patient had gone through the shock stage smoothly, roller-flayer bistoury could be applied to remove the scars in extensive 3rd degree wounds and the depth should approach the depth of normal tissue without causing bleeding. As a result, MEBO could penetrate in time and the healing time would shorten. For the mixed deep 2nd degree and 3rd degree wounds or 3rd degree wounds in which the scar was difficult to remove, number 11 blade was applied to deepen the steak and remove the scar when it was separated from its base. MEBO should be reapplied every four hours. The limbs should be redressed in time to ensure the moisten environment since MEBO could easily lost during turnover. 2. Treatment in the middle and later stage lasted about a week. Most of the wounds had liquefied and the 3rd degree scars began separating under the effect of autopepsia. During this time the necrotic tissues should be removed timely. Debridement should be carried out every 4 hours strictly. MEBO should be redressed promptly to reduce the chance of liquefied products attached in the wounds. Smooth Drainage should be maintained to reduce the chance of second infection. After two or three weeks, most of deep 2nd degree wounds healed, the necrotic tissues in 3rd degree wounds were discharged and granulation tissues began to occur. During this stage the fibrous membrane should be protected carefully, and then the wounds began to heal after the appearance of skin islands. The healing time for most of 3rd degree wounds would be 50~60 days if they were treated properly.

4) Anti-infection and nutrition support

For patients with large area burns, enough broad-spectrum and effective antibiotics should be applied in the early stage. Adjusting the antibiotics according to the results of bacteria culture and sensitivity experiment of drug once liquefaction started. The large amounts of intravenous antibiotics transfusion could be stopped after about 10 days if treating reasonably, and then nutrition support should be intensified to help the recovering of different organs. Using antibiotics again for the secondary infection was based on whether there were toxic granules in the heterophil
granulocyte of blood. If they were found existed, relevant antibiotics should be used to treat until all the toxic granules disappeared.

Because of malnutrition, low immunity, infection, stomach and intestine dysfunction and increased metabolism caused by frequent redressing and scar removing, the large area burns patients had negative nitrogen equilibrium for a long time. Thus nutrition support should be given to these patients to maintain positive nitrogen equilibrium, which could reduce self-consumption and complications, strengthen the healing ability. The nutrients should be taken orally. The patients were encouraged to eat the semifluid foods with high carbohydrate, protein and vitamin content in the early stage according to the principles of gradually increasing. At the same time, fresh blood and albumin should be given in small amounts but many times discontinuously to prevent anaemia and hypoproteinemia. For adults 3000~4000 kcal energy was supplied every day. For those patients with good digestive ability but poor dietetic ability, nasal feeding (total GI nutrition) could be applied. For the patients who could not eat orally or had dyspepsia, parenteral nutrition could be applied temporarily to maintain adequate energy intake, which could promote the healing.

3. Observation of clinical efficacy

Fifty-one large area burns cases were cured with MEBT/MEBO. Among them 3 cases with TBSA over 80% had difficulty of healing by themselves or too long healing time since the burned depth of the lower limbs had reached below deep fascia. As a result, they received grafting after 1 month with the grafting area under 10%. One case died from MSOF complicated with digestive tract hemorrhage since he could not afford effective antibiotics and nutrition support treatment. All other cases were cured, and average healing time was 33.27 days. None of them had disability and functional disturbance, and the curative rate was 98.03%. The healing time was in table 3.

Table 3 The average healing time of 51 deep large area burns cases

<table>
<thead>
<tr>
<th>Healing time</th>
<th>Superficial type of Deep II</th>
<th>Deep type of Deep II</th>
<th>Superficial III</th>
<th>Deep III</th>
<th>Average healing time</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>cases</td>
<td>10</td>
<td>11</td>
<td>19</td>
<td>11</td>
<td>33.27</td>
<td>51</td>
</tr>
<tr>
<td>%</td>
<td>19.61</td>
<td>21.57</td>
<td>37.25</td>
<td>21.57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

1. Clinical treatments for deep large area burns: The traditional therapeutics for burns was early scar-cutting and grafting. Particle grafting and variant grafting were used temporally to cover the wounds in case of inadequate self-skins. Then grafting was carried out many times to heal the wounds. This made those patients who lived through shock stage suffered from the pains incurred by grafting. Some of them died of excessive bleeding caused by scar-cutting or MSOF.
MEBT/MEBO solved four technical difficult problems in the treating of burns such as pain-relieving, anti-infection, preventing necrosis progresiens and no scar remaining in deep 2\textsuperscript{nd} wounds. Especially the frame of MEBT was designed to provide all the necessary constituents to the cells in the wounds, improve their breath function and reduce the incidence of cell shock. Thus it paved the way for the following wounds repair and skin regeneration.

2. The pathologic and physiological changes during shock stage. The capillary vessels in the wounds expanded because of the heat after burns and then their permeabilities improved. Thus the body fluid exchange between the vessels and tissue spaces became abnormal. The fluids in the blood vessels penetrated into tissue spaces or out of the wounds and this could cause tissue edema. The highest penetrating rate was 6~8 hours after burns and it reached the peak in 30~48 hours and then turned to reabsorbing after 48 hours, when edema gradually disappeared. In the early stage the large area burns patients would have haemoglobinuria, which indicated hemolysis, but plasma fluid lost more quickly so the result was still pachemia and increased red blood cells. The red blood cells were destroyed continually and their brittleness was changed. Thus they could easily be eliminated by reticuloendothelial system. Since the exudation of lots of plasma fluids, the effective circulation volume decreased, vessels began to shrink, sympathetic nerves became excited, the secretion of catecholamine increased, glomerular arteriole shranked, and the blood flow in the kidney reduced. The patient had little urine or no urine temporarily. Little urine indicated hypoperfusion in the kidney and ischemic necrosis in the nephric tubule could occur since prolonged shrinkage. This would be one of the reasons for renal failure. The incidence of renal failure and other complicated syndromes in large area burns patients would be reduced if treating shock actively, supplying fluids rapidly and relieving the spasm of renal parenchyma and renal arteriola.

3. The biochemical changes of blood during the shock stage. The albumin content would decrease significantly in early blood biochemical exam if TBSA over 50%. Most patients would have albumin content below 29/2 but little change in globulin content. In serious cases, they would have decreased A/G or even conversed result. Albumin had a small molecular weight (about 68.5 thousand), and it could easily penetrated with other plasma components into tissue space or wounds surface. Albumin had important functions in maintaining plasma colloid osmotic pressure. One gram of albumin could keep 18ml water in blood circulation. If albumin lost too much, the plasma colloid osmotic pressure would decrease and edema would occur. As a result, albumin replenishment carried out 48 hours later at reabsorbing stage was recommended. As the progress of the illness and the supplement of albumin, whole blood and other nutrients, the self-synthesis of albumin would increase and all the biochemical indexes would return to the normal level. The traditional treating method for large area burns would cause the content of blood ammonia to increase in the early stage. This was caused by lots of endotoxins coming into hepatenteral circulation. However, all the 51 cases treated by MEBT/MEBO in our department did not have increased blood ammonia because the frame of MEBO exerted skin function.
It was for this reason together with the continuous discharge of liquefied products that endotoxins could not stay in the wounds for a long time. Besides, early food intake, early defecation and strengthening the stomach intestine functions were important measures to decrease the incidence of complications and irritability reactions since they could promote the discharge of endotoxins.

4. The problem of bacteria growth in the wounds. Large area burns patients were treated with MEBT/MEBO. Germiculture was carried out in the early stage of liquefaction. The result was that most of them had pathogenic bacteria growth, but this didn’t affect the healing time. Professor Qu Yunying in Binzhou Medical Institute found the antibacterial mechanism of MEBO after lots of research. MEBO would cause the variation of the structure and biological characteristics of bacteria, and the variation of bacteria colony led to the variation of the biochemical reaction, antigenicity and toxicity. The anti-infection mechanism of MEBO was decreasing bacteria’s pathogenicity and increasing the patients’ nonspecific immunity functions by changing the biological characteristics of bacteria in the wounds and decreasing their reproducing rate. It was well known that bacteria would not cause infection if they lose pathogenicity. MEBO could exert strong anti-infection effect in the middle and advanced stage of the wounds. Although pathogenic bacteria would grow, the wounds would heal on time. The 51 cases had a 74.50% positive rate of germiculture, and the positive rate became 100% after 10 days. The shortest time of using plenty of intravenous antibiotics was 11 days with the longest 21 days, and the average was 12.5 days. There were two icteremia cases, accounting for 3.92%, and their results of blood culture were identical with that of the wounds. This was caused by not insisting in using antibiotics and not enough nutrition support with poor economic conditions. Later proper antibiotics were applied according to the drug allergy result and nutrition support was strengthened, the symptoms were soon under control. Clinical experiences proved that professor Xu Rongxiang’s scientific judgment, the antibiotics should be stopped to use after treating the large area burns patient for 10 days with MEBT/MEBO, was correct. The premise was the treatment in the first 10 days followed normative MEBT/MEBO instructions.

References