1. INTRODUCTION

According to the International Committee of the Red Cross and Red Crescent Societies (ICRC), there are approximately 110 million landmines scattered in 64 countries around the globe. Landmines left behind by soldiers continue to terrorize and destroy human lives long after wars and fighting have ceased; moreover, little research has been done to determine how long landmines actually remain active. We do know, however, that landmines continue to explode daily, decades after being planted. Indeed, the United Nations Secretary-General has stated that "landmines may
be the most widespread, lethal, and long-lasting form of pollution we have yet encountered“ (1).

Given the fact that mine detection and clearance technology are at least 20 years behind mine design (2), and new mines are continuously being laid, the landmine crisis will unfortunately plague humanity for a long time to come, unless urgent measures are taken now to remedy this disaster situation. At the present rate of mine clearance, it is estimated that it will take 1100 years to clear the 110 million landmines existing, assuming that no more are laid (1)! But as we well know, new mines are continuously being laid. In 1993, while 100 000 landmines were cleared worldwide, 2 million were being planted! The number of active landmines around the world and their constant augmentation, not to mention devastating consequences, is an urgent public health matter that needs to be addressed.

In Afghanistan, nearly 600 000 landmineralated casualties have occurred during the last 15 years (one out of every 50 Afghans), a third of these victims being women and children. Approximately half of these 600 000 victims lost their lives, while the other half remain seriously disabled with amputated limbs and/or blindness (2). In Cambodia, one out of every 236 people is an amputee due to a landmine explosion (8). Worldwide, nearly 10 000 people, most of them innocent civilians (1), lose their lives every year because of landmines, and thousands more are maimed and/or blinded (2,3). Moreover, 55% of the victims may die before receiving assistance, and those who survivors require, on average, 2.6 surgical operations each (7), as well as longterm rehabilitation. In short, the socioeconomic impact of thousands of handicapped victims, especially the young, in societies that in general have no welfare system, is enormous. In most agrarian countries such as Afghanistan, Angola, Cambodia, Mozambique, or in other African countries, the loss of even one limb makes it extremely difficult for a person to carry out normal daily economic activities. In addition, psychologically these victims are perceived or perceive themselves as being a burden on their families and communities, and often turn to begging to survive.

Posttraumatic stress disorder (PTSD), a delayed response to trauma, is common among landmine victims (4). Within a few weeks of the mine explosion, the traumatized person may exhibit symptoms of intrusive recollection in the form of traumatic nightmares, daytime fantasies and psychotic re-enactments. Victims also suffer from insomnia and demonstrate behavioral patterns aimed at avoiding any perceived risk that may resemble what led up to the experienced trauma (6).

In addition to the direct consequences of landmines, these manmade indiscriminate weapons have significant indirect effects. The presence of minefields, for example, can prevent the population's access to safe drinkingwater, causing, in turn, intestinal diseases, especially diarrhoea (3). Also, by preventing the cultivation of farmland, landmines precipitate or worsen food scarcity and hence, malnutrition. Indeed, malnutrition and diarrhoea interact with each other in a vicious cycle, resulting in debilitating health consequences, especially among young children and infants. Landmines can also worsen iodine deficiency disorders (IDD) in villages or towns located in iodinedeficient soil areas, by preventing access to food being transported in from iodinesufficient areas, etc. Needless to say, it is also very difficult to conduct vaccination campaigns, or indeed any type of public health campaign using mobile teams in mineinfested areas.

Landmine casualties themselves place an enormous burden on warstricken countries. A mother killed or mutilated by a landmine places her entire family at risk of malnutrition and disease. A child mutilated by a landmine often becomes a burden on its family, health services (if there are any), and society in general. Countries that suffer the most from landmines are also those in general whose medical infrastructures have been severely damaged by war. Landmine injuries require skilled surgery, large amounts of blood, antibiotics, other drugs and prosthetic devices, and intensive physical therapy. A study of patterns of hospital utilization show that even if only 4% of a hospital’s admissions are landmine victims, they tend to utilize 25% of all surgical services and resources (5). In a country where resources are already scarce, caring for landmine victims draws resources from other essential health services, and therefore tends to worsen the health status of the population overall.

The landmine epidemic in 64 countries is indeed a major public health problem. Even if the manufacturing and military use of landmines were banned internationally today, the existing mine-infested areas around the world would continue to affect the health and well being of countless innocent victims for decades, if not for generations, to come. Thus a comprehensive and integrated health programme aimed at prevention, treatment and rehabilitation of landmine injuries, including treating the psychosocial consequences of landmines, is urgently needed.
Landmines, in this paper, refer to antipersonnel mines.

For example, landmines planted in Libya in 1942 killed four persons in 1990 (5); and in June 1995, two people were killed by a landmine left over from World War II in Sinai, Egypt.

2. LANDMINES

2.1 The effects of landmines

From an epidemiologic perspective, landmines precipitate not only physical, but frequently mental illness as well. Landmines, by their sheer number alone in a particular area, can influence the population's behaviour, which in turn results in a chain of events leading to an overall deterioration of public health and other aspects of social wellbeing. Farmers who “perceive” the presence of landmines on their land will not cultivate the land, and this will lead to food scarcity and eventually even malnutrition. A landmine explosion, in addition to directly victimizing a member, or members, of a community, will also reinforce the behavioural patterns mentioned above. The victim, besides suffering a physical injury, may also develop a mental injury, namely posttraumatic stress disorder (PTSD).

2.2 Types of mines

The estimated 110 million landmines currently infesting 64 countries (most of which cannot afford demining programmes) vary in size and destruction capacity. In general, the smaller mines are designed to explode when a person walks on them or, in some cases, near them. These are collectively referred to as antipersonnel mines (or landmines). The larger devices are designed to explode when vehicles drive over them and are known as antitank mines. There are also devices called improvised explosive devices (or booby traps). These are designed to explode when a person opens a door or picks up a particular object. In general, it is the military (often under direct orders of the government) that dictates what mines are to be used and where they are to be placed.

Antipersonnel mines, or landmines, are often laid to protect military installations from enemy approach. In some countries, antipersonnel mines are also used to dissuade enemy soldiers from inactivating or removing the antitank mines from strategic antitank minefields. It has also become common to use antipersonnel mines to maim enemy soldiers, because maiming can effectively take out of action not only the mine victim, but two or more other soldiers that would otherwise have to carry the victim to the back lines of combat. In actual practice, however, armies do not always follow such rules, and they utilize antipersonnel mines indiscriminately to demoralize the civilian population by mining passes to prevent access to drinking water sources, firewood, grazing and agricultural land, etc.; in short, the basic minimum needs of the population!

2.3 Direct and indirect consequences of landmines

Landmine victims suffer direct and indirect health consequences. For the purpose of this paper, direct consequences are injuries both physical and/or emotional caused by the impact of the blast itself (i.e., mine fragments or other flying objects accelerated by the mine blast, the collapse or fall of a wall, ceiling, tree, or the like.) Table 1 provides a summary of statistics regarding the occurrence of landmine injuries. (The mental health consequences are listed in section 3.6).

Indirect consequences caused by landmines are mainly waterborne diseases, owing to, among other things, access to safe drinking water being mined; malnutrition because minefields cannot be cultivated; increase in infectious diseases because vaccination teams have difficulty or reluctance to vaccinate near mined areas; the spread of human immunodeficiency virus (HIV) and other blood-borne diseases because mine explosions increase the frequency of blood transfusion, etc. Table 2 provides a summary on the indirect consequences of landmines, which it should be noted often involve a larger number of victims and therefore have a greater impact on public health.
Table 1. Summary of various epidemiological aspects of landmine injuries and posttraumatic stress disorder (PTSD) worldwide

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Value</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence of deaths due to direct injury</td>
<td>10,000/year</td>
<td>(1)</td>
</tr>
<tr>
<td>Incidence of injured who survive</td>
<td>20,000/year</td>
<td>(21)</td>
</tr>
<tr>
<td>Proportion of mine injured dying in hospital</td>
<td>3.7%</td>
<td>(7)</td>
</tr>
<tr>
<td>Prevalence of physically disabled</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Estimated proportion of longterm PTSD among mine victims</td>
<td>30-40%</td>
<td>(12)</td>
</tr>
<tr>
<td>Estimated prevalence of shortterm PTSD among mine victims</td>
<td>15-19%</td>
<td>(12)</td>
</tr>
<tr>
<td>Proportion of mine injured (survivors) who stepped on a mine</td>
<td>29%</td>
<td>(7)</td>
</tr>
<tr>
<td>Proportion of survivors injured by mine fragments</td>
<td>48%</td>
<td>(7)</td>
</tr>
<tr>
<td>Proportion of mine victims losing one or both legs</td>
<td>28%</td>
<td>(7)</td>
</tr>
<tr>
<td>Average number of days spent in hospital (first admission)</td>
<td>22.1 days</td>
<td>(7)</td>
</tr>
<tr>
<td>Proportion of all mine victims requiring blood transfusion</td>
<td>36.6%</td>
<td>(7)</td>
</tr>
<tr>
<td>Proportion of amputees requiring blood transfusion</td>
<td>75%</td>
<td>(7)</td>
</tr>
</tbody>
</table>

Note: Reference No. 7, on which most of the statistics of Table 1 are based, was an analysis of data collected by the International Committee of Red Cross and Red Crescent Societies in Cambodia, Afghanistan and a few countries in Africa. The number of wounded studied was 23,767.

Table 2. Summary of the most important (probable) indirect public health consequences of landmines

<table>
<thead>
<tr>
<th>Landmine primary influence point</th>
<th>Condition(s) or behaviour altered</th>
<th>Diseases especially increased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Agricultural land, water canals mined</td>
<td>Farming activities decrease causing food scarcity</td>
<td>Malnutrition-related diseases</td>
</tr>
<tr>
<td>2 Access to drinking water and firewood mined</td>
<td>People drink contaminated water</td>
<td>Waterborne diseases such as bacterial diarrhoea, amoebiasis, Giardiasis, etc.</td>
</tr>
<tr>
<td>3 Roads and access to public places mined</td>
<td>Mobile vaccination teams avoid the area, results in low or no vaccination</td>
<td>All of the six childhood killer (but preventable) diseases</td>
</tr>
<tr>
<td>4 Increased amputation and injury requiring blood transfusion</td>
<td>Increased demand and frequency of blood transfusion</td>
<td>Contaminated blood transfusion diseases (HIV, trypanosomiasis, malaria)</td>
</tr>
<tr>
<td>5 Mined roads prevent food transport between villages</td>
<td>People have to subsist on local food products that may be iodine deficient</td>
<td>Iodine deficiency disorders, including high perinatal mortality</td>
</tr>
</tbody>
</table>

In a landmined area one can often observe two types of disabled victims, one group with amputated legs and the other with atrophied (poliodisabled) legs, both being the "consequences" of landmines. While the first group is the direct result of a landmine explosion, the second group results from the indirect consequences landmines can have in preventing vaccination coverage, access to fresh drinking water, etc. Indeed, the second group (poliodisabled) may vastly outnumber the first group.

2.4 Characteristics of persons at highest risk
According to the ICRC, those at highest risk of mine injury are the rural poor. Peasants foraging for firewood and food, herding cattle, or tilling their fields are particularly at risk. Similarly, when refugees and internally displaced persons return home at random (i.e., not in organized groups), they are also at risk of being killed or maimed from landmines (8) because they return to areas that often have been involved in fierce fighting and may therefore be heavily mined. They are also at high risk because they are less familiar with their former "changed" environment. In the case of some countries, young men and women are returning who were actually born in refugee camps and have never seen their parents’ land before.

Age and sex distribution studies on landmine victims suggest that the majority are young adult males. In Cambodia, 87% of surviving landmine victims are males over 15 years old, with a mean age of 28 years (20). In Afghanistan, 73% are males between ages 16 to 50, and 20% of the victims are male children (7). However, the age and sex distribution of mine victims who did not survive, is not clear from the studies reviewed.

The ratio of death to injury is considerably greater in children, perhaps because their vital organs are closer to the blast and comparatively less protected, and their bodies are less able to withstand blood loss (2).

Those at highest risk of the indirect health consequences of landmines (i.e., waterborne diseases, malnutrition, childhood infections and IDD) are again mostly the disadvantaged poor, especially children. Some of the conditions exacerbated by landmines, such as iodine deficiency, malnutrition and low tetanus vaccine coverage of mothers, will also affect the prenatal care of the unborn.

3. PUBLIC HEALTH IMPACT OF LANDMINES

Landmines, in addition to killing or maiming, disrupt many aspects of daily life. This chapter reviews the public health impact of landmines, particularly the effect that landmines can have in increasing waterborne diseases, malnutrition, IDD, the spread of HIV, etc.

3.1 Landmines and the risk of waterborne diseases

As mentioned earlier, the mining of roads and passages leading to sources of fresh drinking water, firewood, grazing and agricultural land, has indirect and longterm consequences on public health, particularly of rural populations. Rural populations, especially those who have recently returned from refugee camps and have recently lost a member to a mine explosion, as a result for example of fetching water from a fresh spring or well, will tend to avoid such fresh water sources in future, and instead seek other sources perhaps further away and less safe for drinking purposes. While boiling river water, in general, can make it safe to drink, the fact that often the roads and passages leading to the river or to forest areas for firewood are mined, discourages the villagers from "bothering" to boil their drinking water. Hence, minefields can play yet another role in polluting indirectly drinking water.

In Afghanistan, rural populations, in general, are not used to latrines, and use instead a nearby field for such purposes. Minefields thus also tend to change the behavioural patterns of rural populations and villagers, with urine and human excrement accumulating nearby their homes and ending up as well in passing rivers and tributaries, increasing the high probability of water contamination. Mined roads and passes to sources of drinking water and firewood and minefields around villages force villagers to drink polluted water, which causes, inter alia, diarrhoeal diseases, especially among children during the summer months. And in countries where cholera recurs every summer, the effect that minefields have in preventing access to safe drinking water sources increases morbidity and mortality.

3.2 Landmines and malnutrition

Landmines can worsen malnutrition in many ways. Landmines, by adding a disabled member(s) to the family, exacerbate an already tenuous socioeconomic situation and therefore can worsen malnutrition. A country affected by war loses many "breadwinners" between the ages of 15 and 50 (7,20). In countries where women by tradition are often confined to the home (such as in Afghanistan), the burden on a family to support itself after losing its principal breadwinner is even greater. Landmine victims, especially those severely disabled and/or blind, added to an already
socioeconomically disadvantaged family, make it extremely difficult to cope with this "dual" handicap. Women and children, often with less experience and awareness of the perils of mines, nevertheless have to daily fetch water and firewood and thus, frequently become innocent victims themselves. Indeed, it is believed that the majority of victims in post armed conflict situations are women and children.

Besides agricultural land, landmines are also laid in or near irrigation canals. In Afghanistan for example, where 20% of all agricultural land has been mined (3), agricultural production has been severely affected, and is only 45% of its prewar level (1). The presence of mines in fields makes it very difficult for local villagers, especially returning refugees and displaced persons, to find food. Ironically, mine awareness programmes, which are necessary to help reduce mine injury, also can intensify the person's fear of being blown up by a mine and therefore can indirectly further discourage agricultural activity.

It is difficult to quantify the risk of malnutrition attributable to minefields, because landmining is part of many other disruptive, not to mention destructive, activities of war, such as aerial bombing which can also destroy water dams and irrigation canals. But landmines because of their longlasting presence and the fear they generate, greatly discourage farming activities. It does not matter if there is one landmine, or a thousand in a field; unless they are found and cleared, the farmer will be fearful and will stay away. The hunted farming activities in mined areas, together with the difficulties of food reaching such areas, also because of mined roads, creates a manmade famine situation, resulting in a scarcity of food and ultimately malnutrition, especially among children.

Malnutrition predisposes the affected to infectious and noninfectious diseases by lowering resistance. Since malnutrition and diarrhoea can be both the indirect consequences of the presence of landmines, the biochemical interaction between malnutrition and diarrhoea is worth mentioning. Malnutrition as caused by a nutrient deficient diet is known to predispose people to diarrhoea, and diarrhoea in turn causes further depletion of the body's nutrients. Malnutrition and diarrhoea therefore interact with each other in a vicious cycle causing high mortality and morbidity in a vulnerable population. Because of their interaction, the effect on public health of diarrhoea and malnutrition is considerable.

3.3 Landmines and iodine deficiency disorders (IDD)

The mining of roads and passes, in addition to discouraging humanitarian aid from reaching mine-infested villages, can also prevent food from being transported between such villages. If the soil around a landmine-infested village is already lacking in iodine, iodine deficiency disorders (IDD) will likely worsen.

The import/transport of food grown in iodinesufficient soil to iodine deficient villages, etc., can reduce the incidence of IDD. However, when such transport is prevented by landmines or the like, the iodine deficient village would have to rely on its own local food production, and therefore its population would remain iodine deficient.

As is well known, iodine deficiency is an important contributing factor to birth defects, still births and perinatal mortality. A child born to a mother who is severely deficient in iodine may be born deaf and mute; children born to iodine deficient mothers may also be born mentally retarded. Such mental retardation can be prevented during early pregnancy by adding iodine to the mother's diet, but it cannot be reversed after the birth of the infant. Surveillance of IDD in landmine polluted areas, would be useful both for controlling these disorders and for further understanding of their relationship to landmines.

3.4 Landmine injuries and spread of HIV infection

Landmine injuries, especially limb injuries, the most common injury among mine victims, often cause a great deal of blood loss that needs to be replaced immediately (7,16). According to a study (March 1995) conducted by the ICRC, 28.5% of mine blast survivors lose one or both legs, and the proportion of amputees receiving blood transfusion is 75%, each patient requiring, on average, 3.2 units of blood (7). As mentioned, each victim, on average, needs 2.6 surgical operations, and this further increases the demand for blood (7). Countries affected by landmines are also, in general, those whose medical infrastructure has been destroyed or greatly reduced, including blood bank
capacity (and blood safety) and related services. Most landmine victims originate from rural areas where blood bank facilities may be very limited or nonexistent.

The increased demand for blood transfusions to save lives of landmine victims, together with the lack of adequate blood quality control, may force health workers to compromise on the rigorous blood safety rules needed to prevent the spread of the human immunodeficiency virus (HIV). In some African countries where there are large numbers of landmines and HIV infection, and where contaminated blood transfusion already accounts for 10% of the HIV transmission, landmine injuries put added pressure on blood transfusion services, and may increase the chances of HIV infection among landmine victims, as well as perhaps their families (5). In such circumstances, the transmission of such diseases as hepatitis B, trypanosomiasis and malaria through contaminated blood transfusions could also increase (5).

3.5 The effect of landmines on public health campaigns

In areas where roads, agricultural land and access to public health clinics and public meeting places are mined, a public health campaign such as mass immunization is difficult to carry out. Mass immunization requires mobile vaccination teams. In such a setting, where mobile teams are not familiar with their surroundings, their lives can be put in danger, and therefore villages or towns near minefields are often left out of public health campaigns. A similar difficulty is faced by public health workers and humanitarian agencies when there is an epidemic outbreak close to a mined area. In general, the presence of landmines in and around a village or community interferes with access and delivery of health care, including disease surveillance.

Landmines, by preventing health service activities and discouraging humanitarian assistance, can greatly increase the risk of the affected population contracting infectious diseases. Low or no vaccination coverage in a village will give rise to the six preventable childhood diseases, resulting in increased rates of child morbidity and mortality. Such high mortality and disability rates among children, as an indirect result of the presence of landmines, may, as mentioned, be much greater than those directly attributable to mine explosions. In Afghanistan, most of the poliomyelitis cases of disability originate from provinces where landmine concentration is high (9). This hypothesized relationship between poliomyelitis disability and landmines needs further investigation.

3.6 Landmine injuries and the risk of psychiatric disorders

To suffer the intense pain and shock of having one's limbs or eyes, or both, blown away by a landmine explosion is, needless to say, a severe traumatic experience. Psychologists have studied the effect of such trauma on the mental health of such victims, and psychiatric problems following a traumatic injury can be divided into acute, subacute and longterm reactions (13).

Acute phase. From the first few minutes to hours (if the patient is conscious), the victim demonstrates what is called emotional shock and denial. In the mine explosion site, or in the emergency room, the victim may show bewilderment, apathy, or even, if capable, aimless running away, causing a lack of appropriate lifesaving measures. This is important to understand in the case of mine victims because the aimless running (again, if he/she is able to!) may further endanger the victim in the minefield. Deep anxiety is seen in 10-20% of injured cases. Anxiety often reflects vivid fantasies of having sustained severe injuries with a concomitant increased activation of the nervous system (e.g., increased blood pressure and pulse rate). In some cases, the psychological impact of the event may overwhelm cognitive processes and the victim will not remember anything.

Subacute phase. This phase starts within hours or days (less frequently) and lasts several days to several weeks. In this phase, the patient shows signs of disorganized thinking, a reduced level of consciousness and perceptual disturbances. Symptoms such as panic, aggression, hallucinations and anxiety are common. The subacute phase is also characterized by depressed moods and this may be due to guilt, shame, or grief due to real or imagined losses. Mine injury frequently results in, inter alia, loss of one or more of the extremities and also occasionally in loss of eyes and/or genitalia.

Longterm reaction. Longterm reaction to trauma is termed as posttraumatic stress disorder (PTSD). PTSD arises as a delayed response to a stressful event or situation of an exceptionally threatening or catastrophic nature. The onset of PTSD follows the trauma within a period of a few weeks or months, but rarely after 6 months. The severity of the symptoms correlate with the severity
of the trauma (12). Understanding PTSD is important because it can last for decades or even a lifetime and has profound implications for the quality of the victim’s life, and for the society in which he or she is living. Criteria for PTSD are presented in Annex I.

3.7 Impact of landmine-related posttraumatic stress disorders on public health

Knowing that there are hundreds of thousands of landmine victims around the world, and that many new cases are being added daily, and knowing that PTSD exists among many of these victims, it is necessary to evaluate the longterm impact of PTSD on public health. The incidence and prevalence rate of PTSD among landmine victims are not known. However, a large study conducted in 1987 by the Centers for Disease Control and Prevention in Atlanta, Georgia, USA examined 2490 Vietnam war veterans, which found a PTSD prevalence rate of 14.7% (12). Noncombat-related PTSD rates among Vietnam and non-Vietnam groups were 1.8% and 2.6% respectively (not significantly different).

Another large study commissioned by the U.S. Congress (Kulka et al 1990) found current PTSD in 15.2% of male and of 8.5% of female Vietnam veterans (19). The lifetime prevalence rate among this group was 30.9% for males and 26.9% for females. The study reports that the prevalence rates were higher for those who were injured (without specifying the rates). The fact that the injured had higher prevalence rates suggest that the prevalence rate of PTSD among landmine victims (the physically injured) may be greater than the rates among the Vietnam veterans as a whole.

Based on the above statistics, one can estimate that the lifetime prevalence rate of PTSD among landmine victims in general may range between 30% and 45%, and the current rate between 15% and 19%. Because ethnocultural background and religious beliefs are known to affect the clinical course and therefore the prevalence of trauma-related mental disorders, countriespecific data on the prevalence of PTSD is needed. It is controversial whether the PTSD model is applicable to all non-Western cultures or not.

Friedman and Jaranson (1994) present evidence that the PTSD model is applicable also to non-Western cultures (10). They argue that PTSD is common among Southeast Asian and Central American refugees. The traumatic experience of these refugees included physical injury, sexual abuse, war injury, forced separation from family, torture, etc. (10). Another argument in favour of this is the finding that PTSD patients have neurobiological and neuropharmacologic abnormalities which resulted from the traumatic experience. The neurobiologic alterations include hyperarousal of the sympathetic nervous system, increased sensitivity and augmentation of the "acoustic startle eye blink reflex". They also have neuropharmacologic and neuroendocrine abnormalities which are detected in the hypothalamic, pituitary, adrenocortical, and endogenous opioid systems. Thus, it can be argued that the PTSD model predicts that traumatized patients from both Western and non-Western backgrounds would show similar alterations in the nervous system, suggesting that response to traumatic stress is universal (10).

Mine explosions, as mentioned, often cause psychological trauma without causing visible injury or physical disability. Orley (1995) points out, the recovery environment for such a victim may not be as favourable as for the physically injured (4). This is because family and friends will show more sympathy for the physically injured, but offer only a remark such as Thank God you were not injured to the physically uninjured patient. Not validating the feelings of the emotionally traumatized but physically uninjured patient, may worsen his/her chances of recovery. Thus, it is important to note that the prevalence of landmine-related PTSD may be greater than the number of landmine-related physical injuries.

Although PTSD has been the most studied consequence of trauma, it is not the only psychiatric disorder that follows traumatic events. Major depressions, generalized anxiety disorders and substance abuse may also follow exposure to trauma such as mine explosion (12). Besides the pain and agony that the landmine-related psychiatric victims themselves experience in their lives, their illness has important implications for the health and wellbeing of the community they live in.

The fact that between 30% and 40% of all landmine-traumatized victims are women and children, their psychiatric disorders have the following impacts on family health:

- Since landmine infestation is mostly the problem of developing countries, where there is often little or
no public welfare system, and family size (i.e., number of children) is large, the psychiatric disability of the mother will adversely affect the health and wellbeing of her children, including their nutrition, sanitation, etc.

- A child with a psychiatric disorder is a longterm burden on the family and may disrupt the life of other siblings. The child tends not to do well in school and may be at risk of becoming a substance abuser, whose habit may encourage other siblings or classmates to become substance abusers as well.

Members of the community with psychiatric disorders will put a burden on the limited medical resources of the community, especially on available medical supplies, since it is generally known that they will often somatize their symptoms. Studies also have shown that patients with psychiatric comorbidity who had undergone surgery stay significantly longer in hospital than other patients with similar surgery but no psychiatric conditions(13).

As part of their PTSD Avoidance/numbing strategy, landmine-related PTSD affected refugees and displaced persons will stay away from surroundings or conditions resembling those in which they experienced the original trauma, putting an added burden on the limited financial and human resources allocated by the international and national communities towards their welfare.

In addition, psychiatric disorders make it very difficult to treat any other disease of the victim, especially those conditions that require patient cooperation and compliance, such as tuberculosis.

4. HEALTH PROGRAMMES FOR PREVENTION, TREATMENT AND REHABILITATION OF LANDMINE INJURIES

Before discussing specific programmes, the important role of advocacy, surveillance and intersectoral issues related to landmines warrant particular emphasis. It is very important to create "mine awareness", not only among the population at risk but among the international community at large regarding the devastating effects of landmines on human health and sustainable development. It is also important to realize that landmines, by preventing the return of refugees and displaced persons to their land by maintaining refugee camps, divert UN and other international humanitarian funds from being spent on health, education and rural development. Since minefields turn arable land into unusable land, landmines also reduce available living space causing overgrazing and overcrowding of unmined areas.

The promotion of mine awareness education should be seen as an integral part of health education. The mechanisms set up for mass immunization and AIDS campaigns could be utilized for mine awareness campaigns, particularly for illiterate populations.

Surveillance of landmine injuries, including their direct and indirect consequences on public health, as well as collection of demographic data relevant to populations at risk are very important for planning and implementing effective health programmes. To accomplish this, countries need to strengthen their collaboration with national agencies as well as with nongovernmental organizations (NGOs) and UN agencies concerned.

To mobilize national and international efforts for landmine-affected countries, it is recommended that each affected country organize a National Intersectoral Committee for the Landmines, which may include representatives from the ministries of health, transport, agriculture, urban planning and development, planning, public welfare, etc., to undertake the following: (i) strengthen or initiate surveillance of landmine injuries; (ii) determine the prevalence and incidence of landmine injuries; (iii) work towards formulation of a national policy on how to deal with the landmine problem; (iv) identify training needs and develop training programmes; and (v) create an environment conducive to collaboration with local, regional and international organizations concerned with the landmine problem.

Surveillance data gathered in each country could be funneled to a central data processing centre agreed upon by the National Intersectoral Committee for Landmines. Availability of such data would help the Committee, WHO and other agencies working on landmine issues.

4.1 Mine awareness programmes

From a public health point of view, a mine awareness programme, if properly designed and
implemented, is important for the following reasons: (i) it can decrease the incidence of mine injuries and therefore reduces the incidence of PTSD, blood transfusion-related spread of infectious diseases and pressure on the use of hospital and health facilities and resources; and (ii) it can improve patient survival by giving vital public information on what to do and where to go in case of such a traumatic injury.

A mine awareness programme must target those at highest risk. As mentioned earlier, these are the rural (illiterate) poor. Needless to say, printed matter on how to avoid mines will not benefit them very much if at all. Depending on the social structure in each country affected, other communication channels such as radio, pictographs, etc., must be strengthened and further explored. For example, one overseas radio programme that is broadcast in Afghanistan in the major Afghan languages (Pashto and Dari), is broadly listened to by a majority of the poor. Those who do not have a radio may hear it from those who do. Mosques and churches are also excellent media for reaching the poor, especially if the mine awareness programme implementers can effectively persuade the religious leaders to include mine awareness statements in their daily or weekly sermons. To persuade these leaders, special efforts should be directed to raise their consciousness regarding the effect of landmine injuries on the health and wellbeing of the community. Given the fact that displaced persons and returning refugees are at high risk of mine injury, mine education classes should also be promoted among these groups.

To monitor the effect of these programmes, it is important that mine awareness tests in local languages (oral tests) be given to randomly selected target populations (i.e., groups at risk).

Because of the impact mine awareness programmes can have in reducing the incidence of mine injury and improving survival, it is recommended that, as a first step, mine awareness programmes around the world be evaluated. The strengths of programmes that have proved most effective should be communicated to those countries that either do not have a programme or have one that is ineffective. Such evaluation and communication would have great returns for a relatively small investment of funds made for the health of thousands who are at risk of mine injury and the psychosocial consequences that follow. Currently UNSponsored landmine awareness programmes exist in Afghanistan, Angola, Cambodia and Mozambique (18). Lessons learned from existing programmes will also help concerned agencies, international and national, to strengthen their efforts to reduce the incidence of such injuries.

A landmine awareness programme should also include a mine avoidance component. A village-based (or village-specific) strategy might include fencing or marking off of the mined area. This is where the linkage between demining programmes and landmine awareness programmes occurs. It is important that the responsibility and duties of each programme (if separate) are clearly defined and coordinated. Coordination should be carried out under the ministry of health in each country affected. However, in a warravaged country, the ministry of health may not be functioning at a level, or at all, that could effectively carry out national coordination. In such a case, technical support from WHO with the ministry of health would be useful. WHO could provide the ministry with technical assistance on how to best coordinate the various landmine-related programmes, including information on what an efficient programme could accomplish in reducing mine injury incidence, improving survival chances and caring for the disabled.

**Transporting the injured.** The proportion of landmine casualties that will die before reaching a medical facility depends on the type of landmine exploded. Experience from around the world indicates that as many as 50% to 80% may die before reaching a hospital or health facility, and the majority of these die due to blood loss (2,5). It is further understood that the first six hours is critical for a landmine victim, and available data suggest that landmine victims take, on average, 6 to 36 hours to reach a health facility (5). Needless to say, shortening the arrival time will improve survival chances.

The ICRC experience in Afghanistan shows that survival rates improved dramatically when taxi fees, or bonuses were paid to drivers who delivered landmine victims direct to hospitals or nearest health facilities (2). This will be a reasonable recommendation to make (i.e., to pay taxi drivers who transport landmine victims). However, most rural areas do not have taxis or even a sufficient number of other transport vehicles that may be available at anytime to transport a victim. In this regard, the recommendation of Nixon (1995) is worthwhile considering. She proposes that an NGO small business credit programme might investigate the feasibility of loaning money to village entrepreneurs in farflung settlements for the purchase of rural (truck or jeep) taxis which could also be used as local
ambulances to transport mine victims to hospital, amputees to rehabilitation centres and serve other important community health needs, and be paid for delivering patients by receiving facilities (2). To do this, one could identify all those villages that have landmine problems and also do not have health facilities for offering primary health care for the injured.

**Training villagers in firstaid.** At a community or village level, the availability of a person(s) with some basic firstaid skills could save lives and improve survival rate. A person who knows how to stop bleeding, whether or not to apply a tourniquet (a tourniquet incorrectly used can damage tissue and result in otherwise unnecessary amputation), can do mouth to mouth resuscitation and can bandage a fracture would be a "shortgap" asset to the community. The training of such individuals could be carried out by NGO or nonNGO clinics or hospitals, nearest to each village near a mine field. (Training courses could be held periodically.) The persons selected for such a course must be those who are most likely to reside in the village, preferably people with some business such as pharmacists, shopkeepers, barbers, etc. Often, paying a small stipend (or honorarium) during their training could be used as an incentive. However, the nearest clinic or hospital may not have people who are qualified to be such trainers. In this case, WHO, or another agency concerned such as the ICRC, could provide the technical training needed (through, e.g., a consultant) who would travel from place to place to train the relevant health facility staff. Offering a per diem for the health facility trainees (only during training), the skills transmitted as well as some essential drugs to the facility, would provide adequate incentive for such training. The provision of such training would help to not only improve survival of the mine victim, but would improve the survival chances of any other injured person, regardless of type of injury.

**Improving capacity and quality of mine injury treating facilities.** As mentioned, countries affected by war or civil war invariably also suffer from destruction of their health infrastructure. Mine injuries are complicated emergencies requiring skilled surgeons and adequate health services. As a first step, a quick survey and analysis of the availability and capacity of such facilities is required to improve or expand existing capacity. The need for trained staff to handle landmine injuries is often the greatest because war frequently causes a "brain drain" of trained staff. In assessing training needs, both shortage of trained personnel and the ongoing occurrence of landmine injuries are likely to continue for years if not decades during the postwar period.

National disaster management planners should thus link emergency and postemergency plans as a "development continuum" plan. This type of linkage is especially important in the case of training personnel, because many NGOs are involved in helping countries affected by war, and their number and funds tend to decrease as the "emergency" state ends.

Therefore, it is recommended that WHO should continue to help the ministries of health in affected Member States during the pre (emergency preparedness) and early phases (emergency relief) of an emergency so that the resources of NGOs can be utilized in training national staff that can handle mine injuries during a prolonged war, or in the postwar period. Implementing such a plan would allow better allocation of limited human and financial resources from the international and national communities. The goal of WHO, in this context, is to strengthen national capacity in emergency preparedness and disaster relief.

As to what type of training is necessary, and for how long and where, are specific issues that need to be addressed following the initial survey and needs assessment missions for each affected country. As a general rule, however, a country infested with mines needs nurses that are trained in providing emergency care as soon as an injured person arrives at the health facility, and also preferably to be able to treat the subacute phase of the psychiatric trauma of the victim. As discussed earlier, treating the psychiatric problems of the patient during the subacute phase is important in preventing post-traumatic stress disorder, which 30-40% of landmine victims develop.

As many landmine victims need surgery (28% of which undergo amputation), a referral system for victims must be carefully worked out. Again, at the referral level facility, skilled surgeons are necessary to handle the complicated surgery needed. Training of general surgeons to handle landmine injuries may be above and beyond the capacity of developing countries affected. The cooperation of WHO and other agencies concerned such as ICRC, will be needed to train surgeons at national level. While these surgeons are being trained, expatriates will need to be brought in to cope with the emergency situation.

For countries with landmine problems, a similar longterm training plan is necessary because given
the slow pace of mine clearance activity, landmine injuries sustain the emergency state of war. However, since fewer NGOs may be operating during the postwar period, WHO would need to persuade donor countries and agencies to provide the necessary funds to help implement the above proposed recommendations.

As mentioned, landmine surgery cases compared with other surgery cases utilize a much greater proportion of available hospital resources (disproportionate to their actual number) (5), exacerbating an already limited surgical supply situation. For the sake of landmine victims, and also to prevent landmine casualties Monopolizing supplies from other surgeries, it is necessary that sufficiently adequate supplies be provided. To this end, cooperation is essential between UN agencies, the ICRC and other NGOs. A high incidence of landmine injuries creates a great demand for supplies such as surgical implements, antibiotics, anaesthesia, Xray films, blood transfusion supplies, etc.

Blood transfusion is a particularly important issue because of the risk involved in the spread of HIV (see section 3.4), and other blood contaminants such as hepatitis B. trypanosomiasis and malaria. In areas where there is an HIV epidemic, the provision of facilities that will test blood for contaminants, especially HIV, is very critical to prevent a further spread of the deadly virus, which, as discussed, can be an indirect consequence of landmine injury. The specifics on how such a disaster can be avoided needs further investigation.

4.2 Psychiatric programmes

There are landminerelated psychiatric patients with chronic conditions such as PTSD and there are those that are being added to the pool of disabled who may be in their acute or subacute phases of reaction to the trauma. This latter group constitutes the population at high risk of developing PTSD. Knowing that intervention treatment at the subacute phase reduces (13) the chances of a victim developing PTSD, or at least may reduce the intensity of his/her condition, treatment strategy should be to prevent PTSD and other chronic psychiatric disorders, as well as to treat those with chronic conditions.

**Treatment in their first few days or weeks (subacute phase).** These patients will include those who sustained injury as well as those who experienced severe shock but were not injured. As discussed earlier, both groups require psychiatric treatment. In the subacute phase, disruptive behaviour is the most frequent problem exhibited by the traumatised patient. Firm, but kind, limits for acceptable behaviour should be given (13). Health staff need to learn not to perceive the disruptive behaviour as a personal assault.

Traumatized individuals feel unsafe and terrified. The trauma can cause guilt, shame, low self-esteem, distrust and selfblame. The recovery of traumatized patients therefore requires the following:

(i) **Provide food and rest.** Mine victims may come from a village far away and may need food and rest. Medical treatment should be given as needed, but other interventions may be experienced as an intrusion if the patient is tired, exhausted, hungry and cold. Physical needs thus have first priority (14).

(ii) **Restore sense of safety.** Mine explosion is a terrifying experience, and the patient is likely to feel Unsafe. Provide the patient with a safe environment to restore sense of safety. Reuniting the patient with family and friends is important to restore feelings of safety (14). If it is not possible to reunite family, information about family and friends should be given to the patient, particularly if family and friends were also in danger or affected by the explosion or other events. When to begin to talk about the loss of family or friends must be carefully considered and may differ from culture to culture.

(iii) **Restore selfacceptance and avoid stigmatization.** The rescue worker and the therapist must aid the patient to develop selfacceptance. Avoid further stigmatization. In many cultures the patient is blamed for not having been careful to avoid the mine, or that he or she was foolish and deserves the punishment. Holloway (1985) states that by blaming the patient, we maintain our feeling of invulnerability, the victim is blamed and left isolated at a time when he/she most needs social support (14). Do not blame the patient and also advise relatives and family members to restrain from stigmatizing the patient.
(iv) Provide the necessary "environment" for the patient to express anger. Fear, hatred and hostility are common among victims of manmade induced trauma (14). Since mines are laid by man, often by enemies, the above feelings are common among mine victims. It is very important for the psychological recovery of the patient to express the above feelings, and the opportunity to do so must be allowed.

(v) Validate the patient's feelings. Validation of the patient's feelings is very important in the subacute recovery phase following the trauma. The patient needs to share the horrifying experience, including feelings of powerlessness and helplessness.

(vi) Treatment for posttraumatic stress disorder (PTSD). The search for an effective modality of treatment for PTSD and evaluation of some existing ones are being carried out by several investigators (15). Among the various modalities of treatment, such as "behavioural intervention", inpatient treatment programmer, Eye Movement Desensitization (EMD), which are currently being evaluated the latter has received a great deal of attention (see Annex II).

First described by Shapiro in 1989 (15), the EMD technique is very simple and rapid. The therapist simply elicits rhythmic eye movement while the PTSD patient is visualizing an image of an "intrusive" memory and attends to the negative self-statement associates with the image (15). Spectacular claims are being made regarding the effectiveness of EMD in treating PTSD. However, most studies were conducted on a single patient, or on a small number of patients without a proper control group. Given the simplicity and rapidity of EMD and the large number of patients around the world who are waiting to be helped, it is recommended that an organization experienced in psychiatric research utilize a larger sample size and a placebos' group to evaluate this technique as soon as possible. If proven effective, the feasibility of training the relevant staff from countries infested with mines could be studied, so they could utilize this technique to ameliorate symptoms of landmine victims, including those suffering from PTSD.

4.3 Public health programmes

Greater awareness among health services and relevant ministries regarding indirect public health impact of landmines, such as malnutrition, waterborne diseases, childhood preventable disease, IDD, etc., is expected and hoped to stimulate specific programmes at national level.

Some general suggestions can be offered to help control the indirect consequences of landmines.

- Reducing the demand for firewood could decrease the chances of landmine injury among those who venture out to gather it in or near mined areas. Fuel efficient lowtechnology solar cookers provided to the villagers will, to a great degree, reduce the need for firewood and thus save lives, and reduce deforestation.
- Finding ways to obtain safe drinking water for villages whose water sources have been mined will help to reduce waterborne diseases. Mine clearing agencies may clear a path of land leading to the water source and fence off the rest of the area with clear warning signs. Alternatively, water may be piped to the affected village until mines are cleared.
- To reduce the risk of shepherds and farmers suffering landmine injuries and to reduce the problem of overgrazing, it would be useful to utilize the concept of Military minefield breaching (2). This would require working with the mine clearing agencies to locate minefree detours to pasture land. Finding safe grazing land for the affected villagers would help them with their food shortage, as well as reducing their risk of mine injury.
- To provide primary health care delivery, especially vaccination coverage, each province within an affected country should develop special mobile teams trained in dealing with landmine injuries. These teams would need the cooperation of landmine clearing and other relevant agencies for finding safe routes to the affected villages. These teams could also distribute concentrated food items such as those provided by UNICEF for children (as well as UNHCR and WFP) and could also treat women and children with iodinedeficient disorders with drops of iodized oil, giving 2 squirts of iodized oil to children and mothers in the iodinedeficient areas will protect those at high risk of IDD for up to a year. Also iodizing salt supplies are relatively simple to administer and cost as little as 0.05 cents per person per year.

As can be inferred from the recommendations above, cooperation of various agencies concerned is essential. For example, NGOs could cooperate with mine awareness programmes by Piggybacking the mine awareness message onto their projects (2). NGOs involved in agriculture and the provision of safe drinking water could coordinate their activities with mine clearing agencies to provide safe
drinking water (as proposed above) to landmine-affected areas. Such coordination at the national level could be carried out either by the ministry of health or the National Intersectoral Committee for Landmines (mentioned earlier). It would be useful if the agencies concerned could help to strengthen national capacity of these two bodies to better organize and coordinate interagency cooperation.

4.4 Rehabilitation programmes

Landmine-related disabilities include the directly disabled (physical and/or mental) and the indirectly disabled (poliomyelitis, IDD cases, etc.)

Rehabilitation of the physically disabled. There are hundreds of thousands of mine disabled, to whom at least 8000 more are added annually, a majority of whom have numerous difficulties, among them being:

- the amputated disabled need prostheses, which are hard to find and when they are located, several fittings are generally needed during the first year. Once the fittings are accomplished, the prostheses require maintenance; some last only a few years;
- a disabled child may need a new prosthesis every six months (5). A 10-year old child may need at least 25 prostheses during his/her life time;
- the majority of the disabled may live in rural areas with no or very few transportation facilities. They have difficulty reaching a rehabilitation centre, therefore many may just give up treatment, increasing the burden on the family.

To mitigate some of these consequences, it is proposed that decentralized prosthesis (or factories) with Outreach capacity be established in affected countries. For the purpose of sustainability, it is important that the affected countries develop their own prosthesis facilities, including production and maintenance capacities. It is also recommended that the prosthesis facilities have a recruitment policy of giving preference in hiring to amputees who can still utilize their hands in producing prostheses. This would generate the following benefits:

- provide jobs for the disabled (economic benefit);
- give the disabled (and others) a better understanding of the attitude and feelings of other disabled, and better serve this handicapped group;
- the fact that disabled workers would be working alongside other disabled would help them to psychologically better cope with their disability;
- the fact that the disabled would be working for the disabled could help the country to obtain external financial assistance. A project of this type would also help WHO convince donors to contribute at least to the initial development of such a project. The role of WHO may therefore be to help the affected country technically on how to develop such a project and to help obtain financial support from donors for the project.

As far as transportation of disabled persons is concerned, the decentralization of the rehabilitation programme, if it also has the capacity for Outreach, would help the disabled. Furthermore, if the recommendation of lending money to local villages to buy jeeps or trucks could be implemented, decentralization together with the availability of vehicles could also help to alleviate the innumerable obstacles that face these handicapped victims (Table 3).

3 Disability as defined by WHO (1984) is "any restriction or lack of ability to perform an activity in the manner, or in the range, considered normal",

Table 3 Proposed programmes to help prevent, treat and rehabilitate victims of landmine injuries

<table>
<thead>
<tr>
<th>Programme/activities</th>
<th>Objective(s)</th>
<th>Expected results</th>
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<tbody>
<tr>
<td>Mine awareness</td>
<td>Improve mine avoidance behaviour</td>
<td>Reduce incidence of landmine injury</td>
</tr>
<tr>
<td>Train selected villager(s) in firstaid techniques</td>
<td>Improve skills and timely response to injury</td>
<td>Improve survival chances</td>
</tr>
</tbody>
</table>
POSTTRAUMATIC STRESS DISORDER (PTSD) CRITERIA

Criteria for post traumatic stress disorder (PTSD) include:

(ii) The stressor criterion. The patient must have a history of having experienced extremely stressful event (e.g., war, torture, rape, natural disaster, industrial disaster). It is acknowledged that as with pain, different individuals appear to have different trauma thresholds: some are more vulnerable to developing clinical symptoms after exposure to extremely stressful situations than others. When applying the stressor criterion to landmine victims, it is necessary to consider the victim's ethnocultural background, religious beliefs, prior exposure and future expectations (10).

(ii) The intrusive recollection criterion. The recollection of traumatic events in an individual with PTSD evokes panic, dread, grief or despair. These are manifested in daytime fantasies, traumatic nightmares, and psychotic re enactments known as PTSD flashbacks. The traumatic event retains its power to evoke the above psychological reactions for decades or even a lifetime. The reaction can be evoked by auditory or visual traumamimetic stimuli or pharmacologically by the adrenergic alpha2 receptor antagonist, yohimbine (10).

(iii) The avoidance/numbing criterion. Patients show behavioural strategies to avoid any situation in which they perceive a risk of facing a stimuli resembling the experienced trauma: they also exhibit Psychogenic amnesias, which is another manifestation of avoidance/numbing symptoms. By psychogenic amnesia, the patient cuts off conscious experience of trauma-based memories and feelings.

(iv) The hyperarousal criterion. Hyperarousal symptoms of PTSD closely resemble that of a generalized anxiety disorder and panic. Hypervigilance in PTSD may be so dramatic as to appear as paranoia. The startle response in PTSD is known to have a neurobiologic substrate and therefore is considered the most pathognomonic PTSD symptom. Neurobiological research indicates that in PTSD a stable neurobiological alteration in both the central and autonomic nervous system may have taken place.

ANNEX II

Transport the landmine victim rapidly
Improve national capacity and health facilities in treating landmine injury, including PTSD
Provide lowtech solar cookers and/or fuel and give priority to demining of areas leading to drinking water sources, etc.
Provide safe access to grazing land
Train mobile health workers/teams and send them to villages, etc. near landmined areas
Establish decentralized prosthesis facilities

Prevent blood loss
Improve treatment and rehabilitation
Reduce deforestation and avoid minefields
Provide safe drinking water
Reduce food shortages
Improve vaccination coverage Distribute concentrated food packages, etc. Treat women and children with iodized oil and iodized salt
Provide locally made prosthesis and maintenance

Improve survival chances
Improve treatment and rehabilitation
Reduce incidence of injury Reduce the incidence of waterborne diseases
Prevent malnutrition
Prevent childhood diseases Prevent child malnutrition Prevent IDD
Improve the quality of life of landmine victims

ANNEX I
EVALUATION OF EYE MOMENT DESENSITIZATION (EMD) TECHNIQUE AS A TREATMENT FOR PTSD

There are several treatment modalities whose efficacy for ameliorating the symptoms of PTSD patients are being studied. These modalities include behavioural intervention, inpatient treatment programmes and Eye Movement Desensitization (EMD) technique. This latter technique which was first described by Shapiro in 1989 (15) has been receiving a great deal of attention because of its simplicity and rapidity. The therapist simply elicits rhythmic eye movement while the PTSD patient is visualizing an image of an intrusive memory and attends to the negative selfstatement associated with the images (15). Spectacular claims are being made regarding the efficacy of EMD. However most studies are conducted on a single patient or a small number of patients without a proper control group.

Thomas and Gafner (1993) utilized the EMD technique with a 68year old veteran of World War II. Before treatment the veteran exhibited startle response, nightmares, depressive moods and other PTSD symptoms. The therapists reported that after one session, his PTSD symptoms were considerably ameliorated (15). Similar reports were made by Page and Crino (1993), and Spector and Huthwaite (1993) all claiming tremendous success with EMD. Forbes et al (1994) investigated the use of EMD in eight PTSD patients. These investigators used several standardized psychological measures, including the Impact of Event Scale, the Symptom Check List90, and the Beck Depression Inventory, to evaluate the cases before and after treatment and at threemonthly follow-ups. The authors reported that patients improved significantly on all measures. The weakness of this study was the lack of a placebo control group, as well as the small sample size of the study. A similar study was conducted by Vaughheban et al (1994) who reported similar results. Vaughheban's findings also suggested that, to some degree, the EMD technique was specific for PTSD.

Recently, Vaughheban et al again evaluated the EMD treatment using a control group. Thirty-six patients were randomly assigned to two treatment groups (one each); one for EMD and another for image habituation training which uses muscular relaxation. A control group (12 patients) was formed from patients on a waiting list for treatment. Although there was a difference favouring the EMD treatment, the difference was not statistically significant. Again, the small sample size and also perhaps the inappropriate control group make it difficult to clearly evaluate the results (15).

The following is an EMD procedure (7):

The following procedure is followed for each patient:

(a) Focus on the traumatic memory/image. This is usually the memory that is the focus of the disturbing flashbacks.

(b) Elicit belief statements about the memory. Clients are asked What words about yourself or the incident best go with the picture?

(c)

(i) Assign Subjective Units of Discomfort Scale (SUDS; Wolpe, 1982). Clients selfassess the traumatic memory and belief statement 0 to 10-point (0=no anxiety; 10=highest anxiety possible). SUDS customarily used to monitor anxiety during systematic desensitization.

(ii) Identify the physical location of the anxiety

(d) Elicit preferred belief statement. This is rated on the 7point Validity of Cognitions Scale (a semantic differential scale: Incompletely untrue, 7=completely true).

(e) Full instructions on the EMD procedure are given.

(f) The patient:
(i) visualizes the memory;
(ii) rehearses the negative selfstatement, e.g. "I am out of control";
(iii) concentrates on the physical sensations of anxiety;
(iv) visually tracks the therapist's index finger, which is moved rapidly and rhythmically back and forth across the line of vision from left to right 30-35cm from the patient's face, two back and forth movements per second (a saccade). The back and forth movements are repeated 1214 times (a 'set').

(g) After each set of saccades, patients are instructed to Blank out the picture and take a deep breath. Then, they bring back the picture and take a deep breath. The picture is again brought back and feelings are assigned a SUDS rating. This procedure requires previous practice by the therapist for fluent performance.

(h) When the SUDS level reaches '0' or '1' the patient's belief in the desired cognition is tested by asking the patient show do you feel about (the desired cognition) from 17?

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