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UPCOMING ISSUES

**Pain and Memory
Physiotherapy of Pain
Headache Syndromes**

Pain and Rehabilitation from Landmine Injury

International pacts such as the Geneva and Ottawa Conventions forbid weapons that cause indiscriminate, unnecessary mutilation¹. Still, these weapons are used worldwide and create victims long after peace agreements have been signed.

Pain, particularly phantom limb pain (PLP), is highly prevalent in landmine victims. These victims, often poor and rural, have much to lose from injury and disability. Relief agencies such as the Red Cross are ill equipped to deal with pain problems, and specialist pain relief organizations such as Douleur Sans Frontières have limited resources. The worst-hit countries lack IASP chapters. Health professionals, particularly members of IASP, have a responsibility not only to treat these victims but also, under the ninth item of the IASP constitution, to inform governments and the public about the suffering caused by these weapons and the measures needed to prevent their use²⁻¹⁰.

Medical needs are divided between initial acute care and long-term rehabilitation and pain management, particularly of PLP. Many factors, however, may limit care. Among these are extremes of geography and terrain; dangers of travel during conflict; and looting of hospitals, sometimes with injury or death of workers. There may be great poverty, with poor education and social structures. Health care funding may be inadequate or limited by donor-derived constraints³.

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Epidemiology

The lack of quantitative data precludes a precise and complete account of the health effects of landmines, but estimates can be made. The International Committee of the Red Cross (ICRC) has collected data on immediate injuries among mine survivors⁵. Several demographic surveys have tried to document the social consequences and frequency of mine-related injuries⁸⁻¹⁰. All available data suggest that the impact of landmines may be grossly underestimated, as only the fittest survivors reach treatment.

Mine injuries. Between 1995 and 1996 the ICRC registered 9384 landmine casualties^{3,5}. That accounted for 27 % of surgical patients seen by the ICRC in three countries. Non-combatants (women, men >50 years, and children <15 years) accounted for 7.3%, 4.2%, and 19.8%, respectively.

Three distinct patterns of injury are^{4,5,7}:

- I (30%) from standing on a buried blast mine. Victims sustain traumatic amputation of the lower limb and often injure the other lower limb or genitalia.
- II (50%) from fragmentation mines⁷, which explode at waist height, have a

killing zone of 25 m, and have an injury zone of 200 m. Injuries to head, neck, chest, or abdomen are often fatal.

- III (5%) from handling a mine. The victim, often a child, sustains severe upper limb injuries with associated face injuries.

The remaining 15% follow no particular pattern⁵. Coexisting long-term injuries may involve the eyes and peripheral nerves.

Social impact. A study of 206 communities in Afghanistan, Mozambique, Cambodia, and Bosnia found a heavy toll in physical, mental, and economic disability⁸. The WHO Global Burden of Disease—which assesses the impact of social, economic, and physical handicap on the individual, the family, and society—rates below-knee amputation as the midpoint of severity. Limb amputation impairs physical and hence earning capacity and may be accompanied by profound psychiatric problems and ostracism. Loss of income occurs through loss of land and livestock, and reduced access to food and water supplies. Agricultural production might be tripled in some areas by removal of landmines⁸.

Numbers of amputees. Fatality rates average around 40%. For each person killed, 1.5 are injured^{4,5,9}. Every year landmines kill 15,000 people, mainly civilians of whom 20% are children younger than 15 years^{7,5}. Thus a decade from now, there will be about 250,000 documented landmine-related amputees. There may be many more, as there are 100,000 amputees in Angola already (J. Meynadier, personal observation). A retrospective analysis of 720 patients injured by mines suggests an overall amputation rate of 28%. By combining ICRC data⁵ about residual disability with the above-cited survey of landmine injury prevalence⁸, one may estimate the number of amputees in the four countries studied. Further data on the numbers of mines per square mile in these and other countries⁷ reinforce these weapons’ potential health problems in terms of amputees per 1000 inhabitants (Table 1).

Medical Needs

Landmine injury victims are one group among many seeking medical care in those countries where mines have been used. Their relatively small annual needs are compounded over time because their long-term medical attention drains scarce resources, particularly as victims accumulate.

Acute care³. Evacuation of the injured from the minefield, control of bleeding by pressure dressing or tourniquet, and splinting of fractures are immediate needs. In wartime an epidemiological approach based upon first aid, tetanus vaccination, and antibiotic prophylaxis is more cost-effective than the traditional approach of urgent surgery. Basic nursing care saves more lives than heroic surgical interventions and is more easily available locally. A chest drain should be inserted if penetrating chest injuries are suspected. Antibiotic prophylaxis (benzylpenicillin) and tetanus prophylaxis should be administered. Delayed surgical intervention influences overall quality of survival⁶. Traumatic bilateral above-knee amputation and/or signs of intra-abdominal bleeding are ominous and justify an aggressive approach⁴.

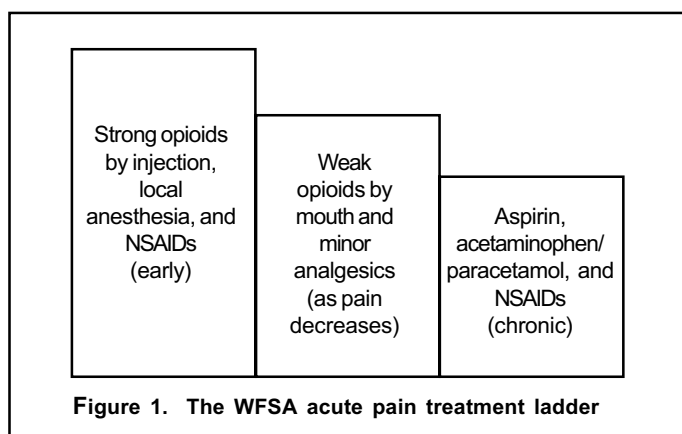
Rehabilitation and pain control for landmine survivors have gained little attention so far. Instructions for the treatment of postamputation pain and PLP should be made available for use by relief agencies and local health care workers.

Evacuation may be slow. Only 25% of those treated by the ICRC arrived within six hours of injury; 15% traveled more than three days. In-hospital care is often limited by inadequate personnel and resources that can make surgery life-threatening. After excision of dead and contaminated tissue the wound should be left open for five days. Repeated operations and skin grafting may be necessary to achieve secondary closure. Sophisticated anesthetic practice may not be possible in areas where landmines are most common. Ketamine and local anesthetics are generally available in such settings and potentially offer effective postoperative pain relief. Spinal anesthesia can be administered safely by trained nonmedical personnel and is used frequently for subsequent operations. Adequate pain relief improves outcome by reducing complications and facilitating early recovery¹¹⁻¹⁴. Routine pain assessment and organized provision of simple analgesic techniques will optimize postoperative analgesia¹¹.

Fig. 1, a modification of the WHO analgesic ladder for cancer pain, depicts suggestions for the treatment of acute postoperative pain, burns, and trauma from a review published jointly by IASP and the World Federation of Societies of Anaesthesiologists (WFSA)¹². This review is available in French, Russian, and Arabic¹⁵.

The WFSA “acute pain treatment ladder” uses well-known and simple techniques of regional anesthesia and a limited number of analgesics in a three-step approach. Its application depends upon on-site availability of these agents. Regional anesthesia provides excellent operating conditions and postoperative pain relief. Single-shot techniques or long-acting (>24 hour) blockade with dilute solutions of bupivacaine at plexus or peripheral nerves are alternatives when opioids are unavailable and pose less risk of hypotension, urinary retention, and immobilization than central axis blockade. Peripheral blockade requires less supervision postoperatively.

	Age (yrs)			Miles per square mile
	<14	15-44	>45	
Afghanistan				40
male	9.0 (2.5)	95.4 (26)	37.1 (10)	
female	8.0 (2.2)	4.5 (1.2)	18.1 (5.0)	
Bosnia				152
male	0.7 (0.19)	8.1 (2.2)	2.3 (0.64)	
female	0.0 (0)	0.0 (0)	0.5 (0.1)	
Cambodia				142
male	4.0 (1.1)	51.3 (14.6)	29.4 (8.23)	
female	0.4 (0.11)	2.3 (0.64)	3.7 (1.0)	
Mozambique				7
male	1.4 (0.39)	14.3 (4.0)	10.6 (2.9)	
female	1.0 (0.28)	3.2 (0.89)	5.6 (1.5)	



Patients with PLP may suffer from an exacerbation of their pain during regional anesthesia, but this problem subsides as the block wears off¹⁴. If this problem occurs during an operation on an amputee, it does not usually respond to opioids, but lignocaine, diazepam, or thiopentone have been successful¹⁷.

Rehabilitation. Rehabilitation starts from day 1 with passive movement and active mobilization on crutches as soon as possible. In the case of lower limb amputation, restoration of function requires a prosthesis to regain mobility and make crutches unnecessary¹⁸. All too often PLP prohibits use of a prosthesis and creates a vicious circle of depression, isolation, and continued suffering. Psychological rehabilitation and recovery of self-esteem are dependent on social re-integration¹⁹.

If you give someone a leg - you are giving him hands.
—Jacques Meynadier

The use of a prosthesis is vital to the rehabilitation process. Because of continued bone growth, prostheses for children need to be refitted every six months. Skin breakdown caused by growing bone may make reamputation necessary.

Phantom Limb Pain

Incidence and characteristics. It is helpful to distinguish between painless phantom sensations, stump pain, and pain in the amputated parts of the body as there are implications for pathophysiology, outcome, and treatment²⁰. Few studies have looked at traumatic amputees and most trials are in elderly arteriopathies, but the reason for amputation does not seem to influence the long-term complication rate. Military casualties suffer the same type and frequency of problem as civilians²¹.

Phantom sensations are experiences of the missing limb as though it were still present. Like PLP, they can start at the time of operation or much later. They can vary from vivid sensations moving in a complex fashion, to a vague and fixed awareness of fingers or toes attached to the stump (“telescoping”). **Stump pain** is pain felt in the stump only and not the absent limb. **Phantom limb pain** occurs commonly both in children^{22,23} and in adults^{20,23–25}. Patients may not mention it for fear of being ridiculed.

PLP varies greatly in frequency and intensity²¹. Emotional and autonomic influences can provoke or reduce it. The pain is generally felt in the more distal part of the amputated limb (toes, fingers) and has been described by Jensen et al.²⁰ as

either exteroceptive (stabbing, burning) or proprioceptive (squeezing, cramp-like) in nature. It can be continuous or intermittent, and its intensity may be mild to excruciating. Phantom sensations, stump pain, and PLP are closely associated. PLP usually is less severe in amputees without phantom sensations or stump pain^{24,25}. It seems to be less likely if the initial amputation is treated actively and a prosthesis promptly used²⁶.

A recent survey in 590 ex-servicemen found that PLP persisted in 47% of the amputees, disappeared in 16%, and required treatment in 55%. In this survey PLP was so severe (VAS 8.7) in 25% that they sought pain consultation. A large, older military survey found nearly identical figures²⁵.

Predisposing factors. Age, site of amputation, or pre-amputation pain intensity seem not to influence the persistence of late (>6 months) PLP^{20,23–25,27}. No conclusive data link the type of anesthetic used during amputation and the incidence of PLP.

Despite earlier claims^{28,29}, a well-controlled, randomized trial did not show a reduction in the incidence of PLP by preemptive epidural analgesia³⁰. This question is important as preamputation epidural analgesia is not without risk. The study did, however, show that active pain control decreased the incidence and severity of chronic pain problems.

Treatment. Treatments must reflect solid clinical experience or experimental evidence. No single form of treatment claims success¹⁹.

Recently it has been suggested that transcutaneous electrical nerve stimulation (TENS), paracetamol (with or without a weak opioid), and nonsteroidal anti-inflammatory drugs (NSAIDs) are more effective for PLP than injections, “centrally acting” analgesics like tricyclics or anticonvulsants, and strong opioids²⁴. Simpler methods of pain relief appear to be more effective and are more accessible in countries with landmine problems. Clinical experience³¹ and that of the voluntary agency Douleur Sans Frontières in the developing world suggests that neurolytic blockade of neuromas may reduce stump pain and that TENS can reduce PLP³².

Evidence for efficacy of second-line therapies for PLP usually is based on small numbers and limited follow-up^{33–39}. These treatments include calcitonin, beta-blockers, neuroleptics, injection of local anesthetic drugs into the contralateral side, neurosurgery, and central stimulation. Other treatment methods may have been tried unsuccessfully and not reported, or not published owing to negative results.

There is increased interest in the use of NMDA antagonists in chronic pain conditions even though side effects limit their current use. They may also have a place in the preemptive management of postamputation pain problems. The wide use of ketamine in developing countries may yield data about the role of this NMDA antagonist to reduce PLP^{40,41}.

Sympathetic blockade has been used diagnostically and therapeutically. However, neurolytic block normally requires radiologic control and its effect gradually wears off⁴².

Discussion

Those who produce and use armaments rarely consider their long-term effects upon health. From a military point of view landmines continue to be considered an effective weapon, due to their low cost and deterrent capabilities.

Implementation of a total ban on production, sale, stockpiling, and use of these weapons will prove difficult if not impossible, as has been the case with biological and chemical weapons. According to the World Health Organization (WHO), at current rates more than ten centuries would be required to remove the more than 100 million landmines already scattered around the globe.

Preventive measures in the countries afflicted with large numbers of mines include awareness programs on the risk of handling and efforts to clear or recover mines for commercial gain. Treatment and rehabilitation of victims will continue to be the principal humanitarian action needed. Rehabilitation and pain control for landmine survivors have gained little attention so far. Instructions for the treatment of postamputation pain and PLP should be made available for use by relief agencies and local health care workers.

The precise impact of PLP on the outcome of rehabilitation of minefield victims in the developing world must be assessed before we can estimate the response needed. However, data collection must not impede continued efforts by relief and medical agencies such as Douleur Sans Frontières. The incidence of severe PLP is at least 25 % in published surveys. PLP may prevent use of prostheses. In the case of single lower limb amputation, injury to the remaining limb may make weight-bearing more hazardous, further jeopardizing rehabilitation.

The importance of pain control for optimal quality of life and long-term rehabilitation is increasingly obvious.

Treating the individual with relatively inexpensive and effective treatments is possible, and neurolytic blockade of neuromas and TENS have been shown to be effective under these circumstances (J. Meynadier, personal observation). The authors' observations support the multimodal treatment plan advocated by Sherman and colleagues^{19,21}. They encourage a sympathetic discussion between health care worker and patient about phantom sensation and PLP and emphasize use of a prosthesis. They also advocate use of TENS and minor analgesics to disrupt the pain-anxiety-tension cycle. Their recommendation for referral to multidisciplinary pain treatment, however, is often difficult to carry out in practice.

Public discussion of landmines has taken place more as a political than a medical dialogue⁴³. For other sources of pain such as cancer, burns, or operation, society's perspective is evolving from a view of the individual as an anonymous host

of a pathophysiological process toward a patient-centered focus. As this evolution advances, the importance of pain control for optimal quality of life and long-term rehabilitation is increasingly obvious. In parallel fashion, the crucial yet still unmet need for pain control among victims of landmine injury must now receive the attention of pain specialists worldwide.

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IASP was founded in 1973 as a nonprofit organization to foster and encourage research on pain mechanisms and pain syndromes, and to help improve the management of patients with acute and chronic pain. The Association brings together basic scientists, physicians, dentists, nurses, psychologists, physical therapists, and other health professionals who work in or have an interest in pain research and management. Benefits of membership include: subscription to the monthly journal *Pain* • receipt of a bimonthly newsletter containing technical articles, comprehensive meetings calendar, list of new books in the field of pain • receipt of a triannual clinical newsletter • receipt of an annual directory of members • reduced rate on IASP book purchases • reduced registration fees for Congresses. For membership information contact IASP at the address below.

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