FIELD TRIAL OF EFFICACY OF LOCAL COMPRESSION IMMOBILIZATION FIRST-AID TECHNIQUE IN RUSSELL'S VIPER (*DABOIA RUSSELII SIAMENSIS*) BITE PATIENTS

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Abstract. A field trial of efficacy of local compression immobilization first-aid technique in 42 Russell's viper bite cases was studied and only 19 were envenomed. Proper immobilization was carried out in 3/13 immobilized cases. The average time of application of the pad was 1.12 hours (range 5 minutes to 7 hours) and the total duration of the pad application was 3. hours 40 minutes (range 30 minutes to 9 hours). Venom levels measured at the hospital before and at 15 and 30 minutes after release of the pad (n=10) showed a rise of 5 to 30 ng/ml of venom following release. Movement of venom antigen was found to be retarded in all cases (n=9) whose venom levels were measured at 15 and 30 minutes with the pad in place. Sixteen out of 19 cases had systemic envenoming, indicating that pad or immobilization alone is not effective in delaying spread of venom. The incidence of local necrosis 3/42 (8%) following use of the pad was comparable to that of the systemic cases without the pad. No ill effects were observed following its application for as long as 9 hours. Local blackening seen in 4/36 (10%) cases was likely to be result of a local venom effect.

INTRODUCTION

Russell's viper bite is an occupational hazard of our farmers in Myanmar which carries a mortality rate of about 10%. Most snake bite patients in Myanmar take from 2 hours to days to get to the nearest health center. Delay in getting antivenom combined with use of ineffective first aid (Tun-Pe *et al*, 1987) lead to systemic envenoming by the time they seek medical treatment. Local compression immobilization first-aid technique was found to be effective in delaying spread of whole venom in prospective Russell's viper bite cases (Tun-Pe *et al*, 1995). This is an extended study of the efficacy and ill effects of the technique applied by the Russell's viper bite victims in the field.

MATERIALS AND METHODS

Field trial of the efficacy of first-aid local compression pad and immobilization was carried out in 40 villages of Taungdwingyi township with the help of local health workers who were instructed on use of the first aid rubber pad (Fig 1) and immobilization technique and its merits were explained with the view that they will impart the knowlege to local farmers. A total of 800 pads, 20 pads with instruction per village, was distributed to the farmers through the health workers. The potential victims were advised to apply it soon after the bite, immobilize the bitten limb with a splint and go to the nearest health station. Since a sufficient number pads could not be supplied, some were kept in the hands of mid-wife who would render first aid treatment to the snake bite victims.

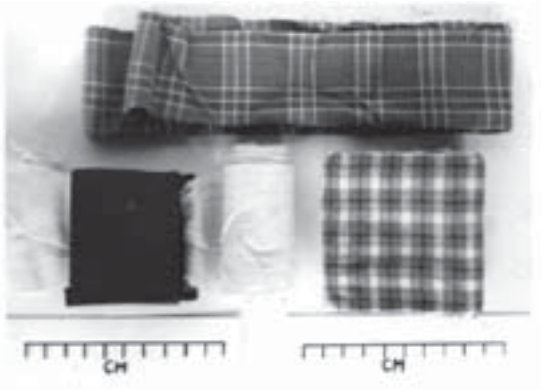

Fig 1–A picture of a rubber pad (left) and a cotton pad (right) with a cotton strip used for bandaging the pad (top).

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Patients and method

Local compression immobilization first-aid applied to Russell's viper bite cases admitted to Taungdwingyi Hospital during 1995-96 were studied. The study was approved by the Institutional Ethical Committee of the Department of Medical Research, Yangon, Myanmar. Clinical features, including degree of tightness of the pad, immobilization of the limb and progress of the patients were recorded in a standard proforma. A twenty minute clotting test (Warrell *et al*, 1977) was carried out on the admission blood sample. While waiting to give antivenom, two blood samples 15 minutes apart following release of the pad were taken in the first 20 pad-applied patients. Since retrospective analysis of the samples of the patients suggested a rise in venom levels following release of the pad, 2 samples 15 minutes apart with the pad in place were collected from the remaining patients. The pad was released after antivenom therapy. Serum samples were collected onto filter paper strips, air dried and later transported to the Department of Medical Research for measurement of venom antigen level by enzyme immunoassay technique (Tun-Pe *et al,* 1991).

RESULTS

Only 26 pad-applied cases were available for study after excluding 16 antivenom-treated cases. Antigen was detected in 10/16 cases whose venom levels were measured before and after release of the pad and 9/10 cases with the pad in place.

The age of the patients was 24 ± 1.5 years (range 10-60 years) with a male to female ratio of 34:14. Tourniquets were applied in 76% and immobilization in 13 (3 properly done). It took 1 hour ± 12 minutes (5 minutes - 7 hours) to apply the pad and it was applied for 3 hours 40 minutes ± 15 minutes (1/2 - 7 hours). They traveled 16 ± 2.7 km (0.8 - 45 km) to get to nearest health station.

The local features of the pad treated cases (=36) were pain (67%), tenderness (58%), swelling (56%), blackening (10%), bleeding (8%), necrosis (8%) and bruising (6%). 84% (16/19) of the antigen positive cases developed systemic envenoming. Spontaneous systemic bleeding occurred in 19% of systemic cases, hypotension in 25%, oliguria in 31%, periorbital edema in 13%, renal failure in 13%, malena in 6%, epistaxis in 6%, hematuria in 6% and fatality in 9.5%. A hand tight application of the pad was carried out in 13/42 cases.

Venom levels measured before and after release of the pad, and in cases whose venom levels were measured 15 minutes apart with the pad in place, are shown in Fig 2.

Mean admission venom levels of local and systemic cases were 27 ng/ml (range 10 - 40 ng/ml, n=15) and 64 ng/ml (50-80 ng/ml, n=10) respectively. Since only 3 cases carried out proper immobilization, no attempt was made to compare the initial venom levels of immobilized and non-immobilized groups. Pyrogenic reactions following the antivenom therapy were observed in 10/36 (28%) of the cases.

DISCUSSION

The results of the study lend further support to the earlier observed efficacy of local compression immobilization technique in retarding spread of venom from the site of bite in prospective Russell's viper bite cases (Tun Pe *et al*, 1995).

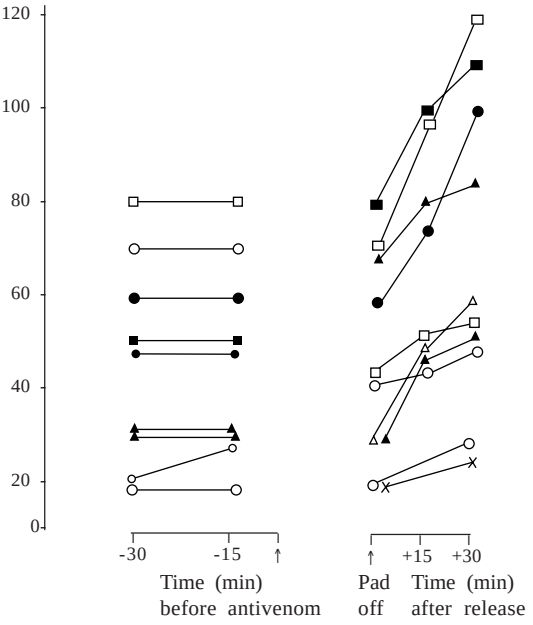

Fig 2–Venom levels of cases with the pad in place, before and after release of the pad.

Since the mean admission venom level of the non-immobilized pad-treated systemic cases (64 ng/ml, n=10) was comparable to that of the systemic cases (61ng/ml)(n=30) of the Taungdwingyi Hospital (Sann-Mya *et al*, 1996), it is suggested that the pad alone is not effective in delaying spread of the venom (Sutherland *et al*, 1979). Since a majority of cases applied the pad on average 1 hour following the bite, it is expected that a certain amount of injected venom must have already been absorbed into the circulation depending on the activity of the bitten limb. Delay in the pad application and lack of immobilization led to rapid absorption of the venom, resulting in systemic envenoming with high admission venom levels. It has been suggested that even walking after upper limb envenomation will inevitably lead to systemic envenoming despite first aid measures (Howarth *et al*, 1994).

It is highly likely that local concentration of the venom in the pad-applied cases could lead to local necrosis, however its incidence (8%) is not higher than that of the systemic cases (10%) of Taungdwingyi (Sann-Mya *et al*, 1996). Local blackening (10%) was due to the local venom effect since it was also observed in cases without the pad. Local pain was twice more common in the pad-treated cases because of local concentration of the venom. However, the intensity of pain was not severe, amounting to demand for removal of the pad. No ill effects were observed following prolonged application of it, up to 6-9 hours.

An effective first-aid technique is essential since victims have to travel 1.6 km (average) to get to the hospital. It was observed that one ampoule (10 ml) of intravenous ASV given to the Russell's viper bite patients with compression immobilization first aid applied at villages prevented development of systemic complications (Tun Pe *et al*, 1964). Because of an insufficient number of pads distributed to the farmers, its application was delayed for 1 hour. However, a cotton pad of a similar thickness made from strips of cotton from personal wear (longyi) could be used in place of the pad on site (Fig 1). In spite of health education, the majority of snake bite victims still fail to immobilize their limbs which plays an important role in retarding spread of venom.

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