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## HAEMODYNAMIC CHANGES IN EARLY PHASE REFLEX SYMPATHETIC DYSTROPHY

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**Abstract.** We studied six patients with early phase reflex sympathetic dystrophy (RSD). Osteoporotic changes were noted in the bones of the affected limb. Despite higher temperatures indicated by thermography, laser speckle image sensing showed no increase in blood flow on the skin surface. Digital subtraction angiography showed arteriovenous shunting or increased density of perfused vessels. Based on these results, we speculate that in RSD persistent vascular contraction caused by pain leads to the formation of arteriovenous shunts in the affected limb with an ischaemic state in the peripheral subcutaneous tissue which is indicated by pain and swelling.

**Key words:** reflex sympathetic dystrophy, early phase, haemodynamic change, arteriovenous shunting.

Reflex sympathetic dystrophy (RSD) is a syndrome induced by invasive stress such as injury, operation, and cerebrovascular disorders. Its main clinical features are pain and swelling, which are much more severe and extensive than would be expected from the primary lesion (1, 10, 20). Ultimately it leads to atrophy and contracture of skin and muscles and osteoporotic change in bones. The pathogenesis of RSD is still not clear and therefore there is no established treatment; it is therefore often difficult to treat.

We investigated the pathogenesis of early phase RSD from a haemodynamic point of view.

### *Clinical assessment*

RSD was defined as follows. Of the following six symptoms at least five should be present in an area larger than the primary injury: unexplained diffuse pain, abnormal skin temperature, abnormal skin colour, diffuse oedema, unexplained limitation of the range of movement,

and worsening of any of these signs and symptoms after exercise (1, 10, 20). The duration of RSD was classified according to the haemodynamic phases identified by Demangeat et al. (7). The early phase (stage I, which is 0-5 months after onset) was studied in this series.

### PATIENTS AND METHODS

Six patients (five men and one woman) who were diagnosed as having early phase RSD of the upper limbs were evaluated. Their ages ranged from 46 to 55 years, mean 50. The onset followed surgical treatment of skin and soft tissue injuries ( $n = 4$ ) and fractures of the carpal bones ( $n = 2$ ). Peripheral nerve injury was obvious in three patients. One patient complained of pain in both upper extremities.

Plain radiographs and thermograms of both right and left upper limbs were taken. Digital subtraction angiography (DSA) of the forearm and the hand on the affected side was done after arterial injection of 15 ml of contrast medium (150 mg iodine/ml) directly into the elbow region on the affected side, at a speed of 2 ml/sec. For both upper limbs, laser speckle flow monitoring of skin blood flow was done with a visual laser blood flowmeter (Lmap-10, M and M Co. Ltd., Tokyo, Japan) that provides two-dimensional colour graphic pictures of blood flow distribution for a given area with a dynamic laser speckle effect. These imagings were graded visually into three (increase, almost the same, reduction compared with the normal side) by three plastic surgeons who had no knowledge of the cases. Blood gas analysis was done of arterial and venous blood samples taken from the bilateral cubital fossa (heparinised venous blood was obtained from the antecubital veins; stasis was minimised by removal of the tourniquet for at least 60 seconds before sampling).

Paired Student's *t* test (for the data on blood gas analysis) was used to assess the significance of differences. A probability of less than 0.05 was accepted as significant.