The Recent Status of Physical Medicine and Rehabilitation in China

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MEDIUM FREQUENCY ELECTROTHERAPY

Medium frequency electrotherapy has been applied in China for about 30 years. In 1969, undamped medium frequency electrotherapy was developed. Since frequency of the current is 2-5 KHz, this therapy is usually called “audiofrequency electrotherapy” in China. At the beginning, this therapy was applied in scar hyperplasia and good effect was gained. Later it was applied in post-traumatic, post-infective or post-operative infiltration and adhesion, hematoma organization, joint fibrous rigidity, frozen shoulder, stenotic tendovaginitis and chronic inflammation, etc. The application presented good effects on alleviating symptoms, promoting absorption, loosening adhesion and softening scar.

At the second half of 1970s’, on the basis of Russian sinusoidally modulated medium frequency electrotherapy (SMMFE) the impulsed modulated medium frequency electrotherapy (IMMFE) was developed. The impulsed modulated medium frequency current is consists of 2-5 KHz medium frequency current modulated by 1-150 Hz low frequency impulse current (square wave, triangle wave, ladder wave, etc). This therapy often produce good effects on analgesia, improving blood circulation and strengthening the tone of skeletal muscles and smooth muscles. So it is usually applied in spondylopathy, osteoarthropathy, periarthritis of shoulder, muscle sprain, myofascitis, hematoma organization, gastroenteroatonia, bladderatonia and paralysis, etc.

In 1985, the first set of computerized and programme controlled medium frequency electrotherapy apparatus was invented. It delivered various kinds of medium frequency current and saved multiple step programme prescriptions. It is so easily to operate that this technique has been popularized rapidly.

In my deparment we have summarized the effect of modulated medium frequency electrotherapy in 125 cases with soft tissue injury, periarthritis of shoulder and spondylopathy. The cured and marked effect rate was 49.5 %, and the total effective rate was 92 %. The analgesia effect was prominent presenting on the pain alleviation apparently after 1-3 times of treatment.

Now, in China there is an obvious tendency—the application of medium frequency electrotherapy is exceeding that of low frequency electrotherapy.
MILLIMETERWAVE THERAPY

In the past it was considered the wave length of millimeterwave is so short that it may penetrate very superficially and maybe can't cause significant effect on organism. In 1980's studies showed while millimeterwave is irradiating on organism, although there is no significant temperature raising in various tissue, biological effect appears still. It is believed that the oscillation frequency of protein, DNA and RNA is near to that of millimeterwave, so during millimeterwave irradiate on organism, the energy is selectively absorbed, and coherent oscillation of tissue particles… “frequency window effect” occurs, resulting rearrangement of particles, and a series of changing of membrane potential, chemical components and metabolic process. The biological effects of millimeterwave is as follows:

2. Energy metabolism of mitochondria changes.
3. In peripheral blood the counts of WBC and lymphocyte elevate. Myelocytes proliferate.
4. The growth of some strains of bacteria and viruses is inhibited.
5. The proliferation of tumor cells is inhibited and inactivated obviously.

Ten years ago millimeterwave therapy has been begun to be applied in clinic. The reports from several hospitals confirmed the effect of millimeterwave therapy on gastroduodenal ulcer. After 20 days treatment the healing rate was 71 %, which was significantly better than that of ultrashortwave or drug (Cimetidine, Novocain) treatment. The treatment course was 1/2 shorter.

Later millimeterwave therapy was applied in early of acute sprain and acute infection (e.g. cutaneous and subcutaneous soft tissue inflammation, lymphadenitis), deeper inflammation (e.g. salpingitis, pancreatitis) and post-operative wound. Millimeterwave may promote inflammation dissipating and wound healing.

We have applied millimeterwave at acupuncture points in the course of radiotherapy and chemotherapy to treat post-radiotherapy and post-chemotherapy leukopenia. In most patients the counts of WBC don’t continuously decrease and in a part of patients the counts increase.

Up to now, studies on the biological effect and clinical application of millimeterwave are proceeding still.

PHYSIOTHERAPY IN ONCOLOGY

In the past it was considered cancer is the contraindication of physiotherapy. But several kinds of physiotherapy have been applied in cancer for more than 10 years. 2450MHz centimeterwave and 915MHz decimeterwave have been applied in hyperthermia of superficial cancer (e.g. skin cancer, breast cancer, metastasis cancer in lymphatic gland, etc) and cancer in body cavity (e.g. esophageal cancer, cervix cancer and rectal
cancer, etc). They have been also applied in microwave tissue coagulation (MTC) through endoscope for small superficial cancer in esophageal, gastric, urinary bladder, cervix, rhino and pharynx cavity. The capacity field technique treatments of 8NHz, 13.56MHz, 55MHz shortwave have been applied in hyperthermia for the deeper cancer (e.g. lung, gastric, rectal and cyst cancer, etc). These therapies combined with radiotherapy or chemotherapy may cause synergic effect.

In my hospital 98 cases with advanced metastasis cancer on neck lymphatic gland were treated with 915MHz or 2450MHz microwave hyperthermia in combination with radiotherapy. The complete regression (CR) rate was 68.37 %, partial (>50%) regression (PR) rate was 22.45 %. Self-control was made in 19 cases. The results proved the effect of radiotherapy combined with hyperthermia was better than that of single radiotherapy. 1,3,5 years survival rate was 38.78 %, 15.79 % and 12.41 % respectively. 10 cases have survived for> 5 years, 2 cases have been surviving for 10-11 years. No recurrence occurs in CR cases.

High energy laser cautery has been applied widely in superficial small tumor for about 20 years. CO₂ laser, YAG laser and Nd-YAG laser were used.

Photodynamic therapy (PDT) has been applied for ten years. Haematoporphyrin derivatives (HPD) (5mg/kg) administrated intravenously under the light or laser irradiation may cause strong photo-sensibilization response and photodynamic effect to be able to diagnose and treat the superficial cancer as laser surgery.

Galvanic electrochemotherapy has been applied for lung cancer and superficial cancer for 8years. Under the positive and negative electrodes the tumor tissue is destroyed.

It has been detected that strong magnetic field may cause the inhibitory and cytotoxic effect on tumor cells.

Above mentioned physiotherapies combined with radiotherapy or chemotherapy or lonely are effective to malignant tumor.

**BLOOD PHOTO IRRADIATION**

In the recent years the ultraviolet blood irradiation and oxygenation (UBIO) and low energy laser intravascular irradiation (LELI) have been developed.

At the aspect of therapeutic operation technique, UBIO and LELI are different.

For UBIO, 200ml of patient's blood drawn out of vein was oxygenated (5L/min) and irradiated by ultraviolet for 10 MEDs and then reinfused intravenously, once every 2 days, total 5 times.

For LELI, a laser irradiation needle connected with an optic fiber was inserted through a catheter into the vein. 1-4mW helium-neon laser pass through the optic fiber and irradiate the blood for 60 minutes, once per day or every 2 days, total 8-10 times.

The biological effects and therapeutic actions of UBIO and LELI are similar:
1. promoting metabolism of lipid and reducing blood viscosity.
2. enhancing fibrinolytic system activity and elevating endogenous heparin level.
3. improving microcirculation and hemorheology characteristic, raising RBC deform-
   ity index and improving oxygen supply to tissue.
4. enhancing activity of superoxide dismutase (SOD) and other enzymes and strength-
   ening catabolism of superoxide.
5. eliminating the middle molecular peptides.
6. normalizing and strengthening cell-mediated and humoral immunologic function.
7. promoting regeneration of neurocytes and activating fibroblasts.
8. UBIO may specially produce bactericidal effect and increase the content of oxy-
   haemoglobin.

UBIO and LELI have been applied in blood hypercoagulability, hyperlipidemia,
ischemic cerebrovascular diseases (e.g. cerebral thrombosis, cerebral infarction, cerebral
arteriosclerosis, etc), ischemic heart diseases (e.g. angina cardis, myocardial infarction,
etc), peripheral vascular diseases (e.g. atherosclerosis, endarteritis obliterans, etc),
pyogenic infectious diseases (including the infection in thoracic cavity, abdominal cavity
and cutaneous and subcutaneous soft tissue), diabetes mellitus, psoriasis, rheumatoid
arthritis, gastroduodenal ulcer and glomerular nephritis, etc. There is no side effect.

Now studies on the action mechanism and clinical indication range of UBIO and
LELI are proceeding.

REHABILITATION MEDICINE

On the basis of the former work of physical medicine, sports medicine, kurortology
medicine, disabled armymen rehabilitation and Chinese traditional rehabilitation
medicine, in the recent 10 years Chinese modern rehabilitation medicine is developing
rapidly. In each province and city, the special rehabilitation facilities were established
and some sanatoriums were expanded into rehabilitation centers. In many hospitals
rehabilitation medicine departments were established or expanded from the former
physiotherapy departments. Now institute-based-rehabilitaton (IBR) and community-
based-rehabilitation (CBR) of hemiplegia, paraplegia, osteoarticular injury and disease,
cerebral palsy, cardiovascular disease, cancer disability, geriatric disease, poliomyelitis
sequela and deaf children speech, especially rehabilitation of neurology and orthopedics
injury and disease, have been generally developed.

In motor function rehabilitation, not only various physiotherapy, but also manipula-
tion, massage, biofeedback, traction, movement therapy and occupational therapy have
been applying and combined with acupuncture, qigong, taijiquan, balneology and
climatology, etc. The patients’ general condition, motor function and quality of life
were improved greatly. Many patients have returned to society again.

As an example, my department was founded 43 years ago. It’s original name was
physiotherapy department. We have developed various physiotherapies and movement
therapy. Ten years ago rehabilitation medicine (including PT and OT) was strength-
ened, and the name of my department was changed into department of physical medicine
and rehabilitation. Now we have 6 doctors, 14 physiotherapists, 1 technician, 13 treatment rooms, more than 500 sets of 130 kind treatment and examination units and 10 rehabilitation beds. Everyday more than 400 outpatients and inpatients were treated in my department and a few patients were treated at home. Most of our patients were suffered from osteoarticular diseases and injury, neurological disease and inflammatory infectious disease. We always adopt integrating treatment programs, such as:

periarthritis of shoulder:
- acute stage: ultrashortwave, infrared
- chronic stage: infrared
  + medium frequency electrotherapy or ultrasound
  + joint mobilization manipulation
  + ROM exercises

osteoarthropathy:
- Chinese herps hot pack combined with low (middle) frequency electrotherapy, ultrashortwave, infrared or magnetotherapy
- + exercises

cutaneous and subcutaneous pyogenic infection:
- infiltration stage: ultraviolet (erythema dosage)
  + ultrashortwave (nonthermal dosage) or milimeterwave
- resolution stage: ultrashortwave (moderate dosage) or infrared
- residual scleroma: infrared
  + medium frequency electrotherapy

hemiplegia:
- motor function assessment: MMT, ROM, Brunnstrom, Bobath, Shangtianmin, Austraria MAS, Barthel, etc
- motor function training: positioning, manipulation, passive movement, active movement, sitting up, standing up, balance, walking, stair activity, OT, ADL training

More work needs to be done further.

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