392

Uchiyama T[1], Sakakibara R[1], Yoshiyama M[1], Lui Z[1], Yamamoto T[1], Ito T[1], Yamaguchi C[2], Awa Y[3], Yamanishi T[4], Hattori. T[1]

1. Department of Neurology, Graduate School of Medicine, Chiba University, 2. Cebtral Laboratory Unit, Department of Molecular Diagnosis, Graduate School of Medicine, Chiba University, 3. Departmeny of Urology, Graduate School of Medicine, Chiba University, 4. Department of Urology, Dokkyo University School of Medicine

PHOTO-STIMULATING EFFECTS OF LOW REACTIVE LEVEL LASER ON MICTURITION FUNCTION IN RATS

Hypothesis / aims of study

Photo-stimulation using low reactive level laser was reported to have neurobiological effects[1-3], and which was clinically used to relieve pain in pain clinic. As effects of the photo-stimulation, inhibition of Aδ- and C- fibre nerve conductions in peripheral afferent nerve tract, activation of central descending inhibitory system via peripheral nerve stimulation, and suppression of local synaptic neurotransmission were reported[1-3]. Micturition reflex, in particular storage reflex, is constructed by spinal reflex via Aδ- and C- fibre afferent nerves, and which is controlled by central descending inhibitory system. Then, photo-stimulation using low reactive level laser will be applicable to modulate neural control of micturition reflex. However there was no report to evaluate this indication. We, therefore, investigate the photo-stimulating effect of low reactive level laser on micturition function, and the mechanism in rats.

Study design, materials and methods

Experiments were performed on adult male Sprague-Dawley rats (11-13 week) in standardized environmental conditions. Under urethane anaesthesia, a polyethylene catheter (PE-50) was inserted into the bladder from the bladder dome with midline abdominal incision. In a part of animals, bilateral L6/S1 intervertebral foramen was exposed by removing muscle and connective tissue with midline dorsal incision. After the operation, animal was placed on mesh table. Thereafter, cystometric investigation was performed under remaining anaesthesia. Interval time between voids, urine volume per void, and maximum bladder pressure during voiding were investigated under continuous saline infusion cystometry. After achievement of reproducible micturition cycle and 30-60 minutes' baseline recording, photo-stimulation using low reactive level laser (180W * 10, 30, 60, 180 seconds) or sham stimulation via prove was irradiated to bilateral L6/S1 intervertebral foramen transcutaneously via the probe contacted to body (indirect group) or directly via the probe non-contacted to body (direct group). Stimulation timings were the following two points: at the end of storage phase and at the beginning of bladder contraction (voiding phase). Recording after the stimulation was continued for several hours until micturition cycle returned to baseline. The data obtained in each condition were compared with each other.

Results

In cases of stimulation at the end of storage phase:

Compared with the baseline record, in indirect sham-stimulated groups, interval time between voids and urine volume per void was slightly decreased, but these were not significant. In direct sham-stimulated groups, interval time between voids and urine volume per void were unchanged. Both in indirect and direct photo-stimulated groups, interval time between voids and urine volume per void was significantly increased. These changes were stimulation-time dependent. These in direct photo-stimulated groups were clearer than these in indirect groups. In any groups, maximum bladder pressure was unchanged.

In cases of stimulation at the beginning of bladder contraction (voiding phase):

Any stimulation did not block bladder contraction. In any groups, maximum bladder pressure was also unchanged.

Interpretation of results

Photo-stimulation using low reactive level laser to bilateral L6/S1 intervertebral foramen at end of storage phase inhibited micturition reflex but not bladder voiding contraction. And the photo-stimulation at beginning of bladder contraction also did not inhibit bladder voiding contraction. These changes were shown in not only direct but also transcutaneous photo-stimulation.

Concluding message

Photo-stimulation using low reactive level laser to bilateral parts of micturition reflex arch modulated storage function but not voiding function. These effects may be considered to be inhibition of afferent nerve conduction, activation of central descending inhibitory system, and suppression of local synaptic neurotransmission, as well as analgesic effect.

References

1. Neurosci Lett (1993) 161; 65-68.
2. Brain Res Bulletin (1994) 34; 369-374.

3. Acupuncture & Electro-Therapeutics Res Int J (1986) 11; 207-216.

FUNDING: **We do not have any financial support for our work**
ANIMAL SUBJECTS: **This study followed the guidelines for care and use of laboratory animals and was approved by Animal Ethics Committee, Chiba University Graduate School of Medicine**