EFFECT OF BILE ACIDS ON REFLEX EXCITABILITY OF THE SPINAL CORD

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Intravenous injection of small doses (10-50 mg/kg) of cholic and desoxycholic acids causes progressive inhibition of monosynaptic and polysynaptic reflex responses.

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In earlier investigations [1] I observed considerable changes in excitability of the neuromuscular apparatus during chronic retention of bile in rabbits, as shown by slowing of accommodation and lengthening of the motor chronaxie.

The object of the present investigation was to study the effect of bile acids – the principal active components of bile – on reflex excitability of the spinal cord motor centers.

EXPERIMENTAL METHOD

Experiments were performed on 38 cats under general anesthesia (urethane 1 g/kg, chloralose 40 mg/kg, intraperitoneally). Mono- and polysynaptic reflex responses of the spinal cord centers for the flexor muscles were recorded in the experiments by the usual method. Test stimulation with single square pulses was applied to the central end of the divided dorsal root L_6. Mono- and polysynaptic reflex responses were recorded from the proximal end of the divided deep peroneal nerve.

Solutions of the sodium salts of cholic and desoxycholic acids in 0.9% sodium chloride solution were injected into the femoral vein in doses of 10, 20, and 50 mg/kg body weight. In choosing the doses, guidance was obtained from data in the literature for the toxicity of bile acids and their concentration in the blood under normal conditions and in jaundice [2-4].

EXPERIMENTAL RESULTS

Intravenous injection of cholic acid in a dose of 10 mg/kg in the great majority of experiments caused increasing inhibition of monosynaptic reflex responses starting 1 min after the injection. By 60 min their amplitude had fallen on the average by 35.8±10%, and by 2 h, to 62.5±15.9% ($P < 0.01$).

After injection of cholic acid in a dose of 50 mg/kg, a more marked decrease in amplitude of the monosynaptic potentials was observed. By the end of the second hour of the experiment their amplitude had falled by 6.6±6.8% ($P < 0.001$). In 3 experiments the monosynaptic reflexes disappeared completely, and could not be evoked even by increasing the strength of the stimulating current by 50-100%.

In some experiments injection of cholic acid in doses of 10 and 50 mg/kg led to an initial slight increase in amplitude of the monosynaptic potentials, but after 2-5 min (or sometimes later) this was replaced by sharp inhibition of the reflex response.

Besides a decrease in amplitude of the monosynaptic reflex responses, a tendency for an increase in their latent periods was observed. Whereas the latent period in 2 groups of experiments before injection of cholic acid into the blood stream was 1.9±0.16 and 2.06±0.16 msec, by the end of the experiment its duration was increased to 2.28±0.19 and 2.61±0.28 msec respectively ($P > 0.05$).

The trend of the changes in the polysynaptic components of the reflex responses clearly depended on the dose of cholic acid. Injection of cholic acid into the blood stream in a dose of 10 mg/kg led in the over-

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whelming majority of experiments to a considerable and progressive increase in amplitude of the polysynaptic discharges. After injection of cholic acid in a dose of 50 mg/kg the changes in the polysynaptic reflexes were biphasic in character: after an initial increase in amplitude until 65-70 min after injection, a sharp decrease took place (by 53.6±8.4%; $P < 0.001$). In individual experiments the polysynaptic discharges were totally suppressed.

In doses of 10-20 mg/kg, desoxycholic acid caused regular inhibition of both mono- and polysynaptic reflex responses.

The results show that cholic and desoxycholic acids, in small doses free from general toxic effects, substantially modify the excitability of the spinal cord centers.

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