

tions with human heart and in which the reaction persisted, although quantitatively decreasing, up to a time when the rheumatic process seemed to have become inactive clinically.

Studies on a larger scale on the various aspects of the serologic phenomenon described

are under way and will be reported upon completion.

Summary. From the results reported it would seem that the presence of autoantibodies to human heart has been demonstrated in 75% of a group of patients with acute rheumatic fever.

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Recuperation from the Effects of Tenotomy on Neuromuscular Transmission.*

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Thomsen, Altamirano, and Luco¹ demonstrated the following changes, related to transmission in muscles 3 to 15 days after transection of their tendons: (a) greater development of tension in the third stages of muscular contraction relative to the first (see Rosenblueth and Cannon²); (b) diminished or abolished post-tetanic potentiation; (c) decreased sensitivity to curare; (d) more intense post-tetanic decurarization. We believed it would be of interest to study neural transmission in muscles which had undergone tenotomy but which had spontaneously re-established continuity of the tendon.

Method. The experiments were conducted on the soleus muscle of the cat 1.5 to 4 months after section of the Achilles tendon. In each study the responses of the operated muscle were inscribed on a drum, the homologous muscle of the opposite extremity being used as a control. Each tibia was fixed with clamps and the tendon attached to the short arm of a lever which exerted traction on elastic bands. The popliteal nerve was stimulated. Curare Merck was administered intravenously.

Results. The findings can be grouped into 3 separate categories: In the first, in which 3 cats were studied, 4, 4, and 3 months after tenotomy, the walk was the same as in recently

tenotomized cats, re-establishment of the tendon not having occurred. In these the muscular atrophy was marked and the development of tension so slight that detailed studies were not carried out. In the second series 3 cats 4, 1.5, and 1.5 months after tenotomy were studied. In all of them the walk was improved and the tendon showed a greater degree of re-establishment than in the first group. Response to the stimulation of the nerve with high frequencies (250-500 per second) was equal to that of normal muscle: however, the graph was more like that of a recently tenotomized subject in responses to lower frequencies, in post-tetanic potentiation, and in sensitivity to curare. In the third series in which 4 cats of 4, 3, 3, and 1.5 months after tenotomy were studied, the walk was normalized and the tendon has practically re-established its former status. The responses to all frequencies of stimulation were within normal expectations. Post-tetanic potentiation was present in only 2 of the 3 cases studied. The sensitivity to curare had not only returned fully, but was actually in excess of normal. The tension developed by the muscle with re-established tendon is only one-half to one-third that of normal muscle.

Discussion. The observations made in this study reveal that it is possible to obtain a restoration of the normal function of neuromuscular transmission altered by transection of the tendon. This restoration does not occur in an abrupt form; that is, the various changes

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¹ Thomsen, P., Altamirano, M., y Luco, J. V., *Medicina* (Buenos Aires), 1942, **3**, 67.

² Rosenblueth, A., and Cannon, W. B., *Am. J. Physiol.*, 1940, **130**, 205.

do not return to normal simultaneously. The first to reappear is the response of the muscle to indirect stimulation at high frequencies, then the response to lower frequencies, then the sensitivity to curare, and lastly the post-tetanic potentiation.

The recuperation of normal functional phenomena as described above takes place in muscle in which the atrophic state persists, which suggests a lack of definite relationship between these disturbances and muscular atrophy.

A hypothesis was previously advanced¹ that

the cause of disturbances resulting from tenotomy might be an alteration of the postural reflexes. The present study shows that the change is reversible, an observation in accord with the previous hypothesis. Of course there is also the possibility that the change in tension resulting in the muscle from the sectioning of its tendon may influence the neuromuscular junction directly.

Summary. The disturbance in neuromuscular transmission caused by sectioning of the tendon disappears when the tendon is spontaneously re-established.

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Effect of Neostigmine (Prostigmin) and Physostigmine upon the Denervated Iris of the Cat.

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It has been shown by Anderson^{1,2} that physostigmine constricts the pupil in normal cats but fails to do so after the ciliary ganglion has been removed and time permitted for degeneration of the post-ganglionic fibers. Similar studies have never been reported for neostigmine (prostigmin). In view of the differences known to exist between physostigmine and neostigmine (the latter being much more effective in relieving muscle weakness in myasthenia gravis) it is possible that neostigmine may have a direct action upon muscle in addition to its known anticholinesterase action. We decided to test this hypothesis so far as iris muscle is concerned.

Methods. Cats were anesthetized with sodium pentobarbital intravenously or intraperitoneally. The hair was shaved from the region of the left eye, the lids were sutured together and a skin incision was then made below and lateral to the orbit. A portion of the zygoma and lateral wall of the orbit was removed. The conjunctiva and Tenon's cap-

sule of the globe were opened and the external rectus muscle identified. The latter was retracted upward and the ciliary ganglion was exposed. If difficulty was encountered, the nerve from the inferior oblique muscle was traced back to its branch which leads to the ciliary ganglion. The ganglion was grasped by a fine hemostat, all its branches were severed, and the ganglion was removed. The wound was then flushed with penicillin solution and the incision was sutured. Since the operation abolished corneal sensitivity and secretion at least temporarily, the chief post-operative complication was desiccation and ulceration of the cornea; a number of cats had to be discarded for this reason.

In some cats the left superior cervical ganglion was also removed. This ganglion was distinguished from the vagus ganglion at the level of the carotid bifurcation and the former was extirpated completely.

Criteria of a successful ciliary ganglionectomy were: (a) pupillary dilation on the operated side, (b) failure of the iris to contract after exposure of the retina to strong light, (c) sensitivity to 0.5% pilocarpine and

¹ Anderson, H. K., *J. Physiol.*, 1905, **33**, 156.

² Anderson, H. K., *J. Physiol.*, 1905, **33**, 414.