morphology. This experiment, with its preliminary results, proved that in the
denervated muscle extract there is a kind of motor neuron protection factor that
can protect the motor neuron from traumatic degeneration and death. The nature
of that factor and its mechanism of action remain to be further investigated.

Investigation of Vascular Implant in Degenerated Skeletal Muscles
Bridging Lesioned Recurrent Laryngeal Nerve
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After recurrent laryngeal injury, how to reestablish the innervation of
the laryngeal muscles to improve the function of the throat. Hirito etc. performed
direct suturing of the nerve and found that there was electromyographic action
in laryngeal muscles but at phonation, the movement of vocal cord was in
disorder. Analysis with laryngeal electromyogram it was shown that
regenerating axons mostly grew in wrong direction. At present most scholars
know that the erroneous growth of the regenerated axons was the main cause of
inducing vocal cord palsy after direct suture of the recurrent laryngeal nerve. In
this experiment vascular implant in autogenous degenerated muscle was used to
bridge the lesioned recurrent laryngeal nerve to correct the erroneous direction
growth problem of the regenerating axons in simple suture so as to improve
laryngeal function.

Eight domestic dogs, 10-15 kg, were selected (2 for control) for this
experiment. Sodium pentobarbital (3% 1ml/kg) was used as intraperitoneal
anesthesia. One side of the recurrent laryngeal nerve was exposed from the
anterior tracheal oesophageal groove, then its medial and lateral branches were
exposed at the cricothyroid junction. A segment of the branches were isolated
by blunt dissection and a lesion of 1cm long was made. The adjacent
thyropharyngeal muscle was cut and made into an autogenous bridge according
to the method of Zhu Jia Kai and placed at the lesioned nerve, as diagram:

Proximal trunk of — Muscle bridge — recurrent laryngeal nerve

A tunnel was made through the muscle at the space between the muscle
fascicles. Then the broken ends of the nerve were embedded into these tunnels,
the neurolemma and myolemma were suture to close up the tunnel. Adjacent
vascularized muscle bundles were first lesioned and wrapped around the muscle
bridge.

After lesion of the left recurrent laryngeal nerve, the left arytenoid of
the vocal cord was abruptly turned outward, vocal cord was obviously shifted to
the left and in a paramedian position. Barking sound of the operated dogs
became hoarse. After rearing for two months the sound of barking gradually
recovered, the frequency, loudness and sound pattern were comparable with
those recorded before operation; these three indices were very close to that
before operation but there was marked difference with the control group
without the muscle bridge. In the control group, the barking sound of dogs was
still hoarse. Vocal cord in the animals with muscle bridges gradually shifted
from a paramedial position to normal position. There was no atrophy, volume
was normal. Using quantitative analysis, there was no marked difference
between the left and right side. Electrical stimulation of muscle bridge was
done on the proximal end of nerve trunk and recorded on a laryngeal
electromyogram. From the induced electromyogram, the "latent period time"
and "the amplitude of electromyogram wave" showed no marked difference
between the operated side and the normal side. Cross-section and longitudinal
sections of the muscle bridge were stained with HE, AchE, and AG stains and
were observed under light microscope, it was found that regenerated axon grew
through the muscle bridge branched frequently. The distal segments aggregated
into many strands, accumulated to the lateral and medial branches of the distal
end, with directional connections. Recently in China and abroad, studies
concerning the pattern of regeneration within peripheral nerve showed that in
proper bridging substance, the distal cut end of nerve (or target tissue) might
release factors that attract directional growth of regenerating axons
(chemotaxtacting factors). These factors induce the regenerated axons to grow
along original path in the distal stump into the target organ and formed
functional connections. This experiment used the bridging technique of
degenerated muscle with implanted blood vessels, the advantage was that
removal of the living sarcolemma tube provides a low resistance pathway for
the regenerating axons, the implanted blood vessel could ensure rich blood
supply to the regenerating axons and promote their maturation. This muscular
bridge is suitable for various distal cut ends to form effective concentration
gradient when Wallerian degeneration of the nerve releases the chemoattracting
factor and transports it in retrograde direction, bringing to a rather good
direction regulating function. This method is better than using direct suturing of
recurrent laryngeal nerve which resulted in fibers of regenerating nerve grow in
erroneous direction, thus greatly raised the recovery rate of laryngeal function.
We had tried and found out that the bridging distance for dogs laryngeal
reccurent nerve could be further increased, the maximum might be 3-4cm.
Regenerating axons could still cross over, approximately 3cm bridging
distance, and had the strongest attraction and the best effect.