THE TREATMENT OF EXPERIMENTAL LESIONS OF THE SPINAL CORD OF DOGS WITH TRYSIN*

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For some years, experimental work has been under way to find some means to inhibit connective-tissue scar formation at the site of surgical lesions of the spinal cord. A preliminary report4 was given on the apparent beneficial effect of treatment with trypsin. In earlier publications,4,6 it has been reported that spinal-cord axons will regenerate in the rat, cat, and dog provided that a formidable connective-tissue barrier does not form. The most striking feature of the average traumatized human spinal cord is the presence of dense scar, which proves upon microscopic examination to be composed of connective tissue. This type of reaction was also demonstrated by Freeman and Wright7 in experimental concussive injuries of the spinal cord. Surgical measures for removal of necrotic tissue reduced markedly the amount of connective tissue which appears to be the major barrier to successful regeneration.

A fibrin network is believed to serve as the bridge upon which fibroblasts collect; and without this bridge they do not take part in subsequent events. Therefore, it was decided to bathe the wound of the spinal cord with a fibrinolytic agent. Since a preparation of modified trypsin was available,1,2,3 it was decided that this material should be tested. Modification of the enzyme involved reaction with hypochlorite.

MATERIALS AND METHODS

Under pentobarbital sodium anesthesia and aseptic conditions, female mongrel dogs of from 6 to 10 kg. in weight were subjected to mid-dorsal laminectomy of two vertebrae with preservation of the facets. The dura mater was opened in the midline for a distance of about 1 cm. and held with traction sutures. A relatively avascular area was chosen on the left side, and the pia mater was incised sharply. A sharp dagger-point blade was then inserted from a point about 1 mm. to the right of the midline and was plunged perpendicularly to a corresponding point on the anterior surface, being careful not to injure the anterior spinal artery. The blade was then swept laterally to give a liberal hemisection. The wound was then checked with a blunt probe. When bleeding was encountered a small piece of hemostatic material was used temporarily for its control. A flanged polyethylene tube with inside di-

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ameter to fit a 25 gauge needle was then threaded through the dura mater about 1 cm. above the section. Over this tube was passed a short strip of tightly fitting tubing to impale the dura mater (Fig. 1). The tube was then tested for patency and possible leaks. The dural defect at the site of incision was then closed tightly with interrupted 6-0 black silk sutures. The tube was secured to the fascia of the adjacent spine, looped in the fascial and subcutaneous layers, and secured in at least 3 places with sutures, being brought through the skin with a separate stab wound. The laminectomy wound was closed tightly in layers with interrupted black silk sutures in the muscle, fascia, and subcutaneous layers. The skin was closed with a continuous subcuticular suture.

![Diagram](image)

**Fig. 1.** Diagrammatic representation of the surgical preparation. The insert demonstrates the sealing device for the tube.

The animal was then enclosed in an upper-body jacket of plaster of Paris, and a Kirschner wire was passed through a tail vertebra. It was then suspended in a stock. The details of care have been described previously. Briefly, they consist of around-the-clock bladder expressions until automaticity is achieved. Hand feeding was used whenever necessary and postoperative care followed the best surgical principles. Daily observations for reflex activity and function were made.

A separate team conducted the injections of materials through the catheter into the subarachnoid space. The materials used were: nothing, lyophilized dog plasma, modified trypsin, and commercial trypsin. Initially, all injections were made at 8 hourly intervals for 30 days. The time was reduced and then the frequency was brought to a single daily injection. A few injections were made intramuscularly, without utilizing the tube in the subarachnoid space.

When the course of therapy was completed, the animal was removed from the cast. Several days later, motion pictures were taken of the animals. At approximately