**INTRODUCTION**

A pivotal difference between the two branches of the nervous system is that the peripheral nervous system (PNS) may successfully regenerate while the central nervous system may only do so in a limited capacity. This recovery in the PNS is based on the proregenerative relationship between axons and the extracellular matrix, a relationship established by Schwann cells. Compressive mechanical stress is important in stimulating the regenerative behavior of Schwann cells (1,2). The objective of this study was to determine whether transplantation of preconditioned peripheral nerves to the injured spinal cord improves functional recovery in a spinal cord contusion injury model (3,4).

**METHODS**

Forty adult Sprague-Dawley rats were used to create a moderate spinal cord injury contusion model. The PSI Infinite Horizon Impactor (IH; Precision Systems & Instrumentation, Lexington, KY) was used to create a contusion injury by uniformly delivering 175 kdyn to the exposed spinal cord. At 1 week post-injury creation, the spinal cords were re-exposed for all four groups. Peripheral nerve grafts were obtained from rat sciatic nerve, either untreated or subjected to mechanical compression for two weeks with inert, non-constrictive tubing. Transplantation of grafts to the contused area of cord was performed following resection of the glial scar. A subset of the animals underwent sham transplantation. Another group of animals underwent a sham operation in which the cord was exposed and 2 mm of friable glial scar excised, but no peripheral nerve was transplanted. Functional outcome was measured using the Basso, Beattie, Bresnahan (BBB) Locomotor Rating Scale. BBB scores were obtained preoperatively and versus sham operation without scar excision (p<0.05). Although mechanical pre-conditioning of the transplanted peripheral nerve did not have a significant effect on the functional outcome at these early time points, histological analysis showed increased axonal sprouting at lesion sites for the transplanted groups versus untransplanted groups (Fig. 1-3). Glial scar excision without peripheral nerve transplantation produced a significantly worse recovery in the early postoperative period versus nerve transplantation and versus sham operation without scar excision (p<0.05).

**CONCLUSIONS**

Functional recovery after a SCI contusion injury was improved following glial scar excision with transplantation of peripheral nerves to areas of spinal cord contusion. The amount of lesion-site axonal regeneration, verified by histological analysis, was higher around transplanted grafts. Although mechanical pre-conditioning of the transplanted nerve did not have a significant clinical effect on functional recovery at this early stage, there does appear to be an increase in axonal sprouting at the lesional site with these experimental groups. Thus, these grafts may improve axonal regeneration and functional outcome with further study required at later time points. Glial scar excision without nerve transplantation resulted in impaired functional and axonal recovery and should not be done alone after contusion injury. Peripheral nerve transplantation significantly improved functional and axonal recovery following contusion spinal cord injury in rats and warrants further investigation for potential clinical applications.