The success of embryonic nervous tissue transplant depends not only on the operative procedures, but also on the selection of fetal graft at appropriate age. Previously, we had made electron microscopic observations on the development and differentiation of the rat embryonic spinal cord, before and after transplantation. Presently, we proceed further the observation of the ultrastructural differentiation of the embryonic rat spinal cord, with the aim of using it for establishing theoretical and practical foundations for employing it in repairing adult spinal cord injury.

Rats weighing about 200 gm were used as host, irrespective of their sex. After exposing the lumbar enlargement of the spinal cord under operating microscope, the dura was incised longitudinally about 0.5 cm. With the help of meningeal forceps, a cut was made using a iris blade along the left posterior spinal artery, and the blade was rotated so as to destroy the local spinal cord tissue, then the tissue was removed by suction. Hence, an about 2 mm diameter hole was made in the hemi-sectioned cord. Embryonic day 14 rat spinal cord was taken out under microscope, the dura and the attaching connective tissues were removed, so that a segment of pure embryonic rat spinal cord about 3 mm long was obtained. The embryonic tissue was carefully aspirated by a glass needle, and injected into the site of spinal cord injury in adult rat. After transplantation, the dura was closed by atraumatic suture. Sample were taken and embedded at 7, 15, 30, 60, 120, 240 days after transplantation for routine electron microscopy. E14 fetal rat spinal cord was composed mainly of neuroepithelial cells and neuroblasts. The ultrastructural characteristics of the former was that there were large amount of isolated ribosome in the cytoplasm. In the latter in addition to the isolated ribosome there was appearance of Golgi body, endoplasmic reticulum. Glial cells and dendrites were all at a primitively differentiated condition. Within 30 days after transplantation, fetal rat spinal cord neurons underwent the processes of reduction of isolated ribosome, increase of cellular apparatus with regular arrangement, nucleoli appeared as signs of development and differentiation. Glial cells, dendrites and synapses also gradually assumed typical features. Between the interface of graft and host, there is lacking of glial hyperplasia. Up to post-operative days 240, there could still be seen the perfectly developed fetal rat spinal cord tissue. The authors believe, due to the undifferentiation of E14 fetal rat spinal cord, after transplantation it could not only survive, but also continue to develop and differentiate. Therefore, in adult spinal cord injury it could act at least in a mechanical repair function.