Abstract

Important breakthroughs in the understanding regeneration failure in an injured CNS have been made by studies of primary afferent neurons. Dorsal rhizotomy has provided an experimental model of brachial plexus (BP) avulsion. This is an injury in which the central branches of primary afferents are disrupted at their point of entry into the spinal cord, bringing motor and sensory dysfunction to the upper limbs. In the present work, the central axonal organization of primary afferents was examined in control (without lesion) adult Wistar rats and in rats subjected to a C3-T3 rhizotomy. Specific sensory axon subtypes were recognized by application of antibodies to the calcitonin gene-related peptide (CGRP), the P2X3 purinoreceptor, the low-affinity p75-neurotrophin receptor and the retrograde tracer cholera toxin subunit β (TCβ). Other subtypes were labeled with the lectin Griffonia simplicifolia IB4. Using immunohistochemistry and high resolution light microscopy, brachial plexus rhizotomy in adult rats has proven a reliable model for several neural deficits in humans. This lesion produced different degrees of terminal degeneration in the several types of primary afferents which define sub-populations of sensitive neurons. Between the C6 and C8 levels of the spinal cord, deafferentation was partial for peptidergic CGRP-positive fibers, in contrast with elimination of non peptidergic and myelinated fibers. Dorsal rhizotomy has provided an adequate experimental model to study sensory alterations such as acute pain and allodynia as well as factors that affect regeneration into the CNS. Therefore, the differential deafferentation response must be considered in the evaluation of therapies for nociception (pain) and regeneration for brachial plexus avulsion. The anatomical differences among the primary afferent subtypes also affect their roles in normal and damaged conditions.

Keywords

primary afferents, cervical spinal cord, dorsal root avulsion, lectin Griffonia simplicifolia (IB4), cholera toxin subunit b (CTβ), calcitonin gene-related peptide (CGRP), purinoreceptor (P2X3)