INTRODUCTION

Neurosurgical rehabilitation

Justin M. Brown, MD,¹ Bob S. Carter, MD,² Keith E. Tansey, MD, PhD,³ and Ross Zafonte, DO⁴

¹Department of Neurosurgery, UCSD School of Medicine, San Diego, California; ²Department of Neurosurgery, Massachusetts General Hospital, Boston, Massachusetts; ³Departments of Neurosurgery and Neurobiology, University of Mississippi School of Medicine, Jackson, Mississippi; and ⁴Department of Physical Medicine and Rehabilitation, Harvard Medical School, Boston, Massachusetts

THE quest to effectively restore motor control following nervous system injury or impairment has taken a number of directions in recent years. Emerging interventions have typically utilized the following concepts: redistribution of residual control, augmentation with artificial control, and regeneration to achieve an improved functional state. Examples of such interventions have included peripheral nervous system “rewiring,” neuromodulation through spinal epidural stimulation and deep brain stimulation, external robotics to replace a lack of motor control, brain-computer interfaces to provide control when very little residual control remains, and even biological interventions in which stem cells appear to have provided augmented recovery in formerly unrecoverable injuries. Patient populations who stand to benefit from such interventions include those with spinal cord injury, stroke, traumatic brain injury, cerebral palsy, brachial plexus injury, spina bifida, severe dystonia, and a number of other conditions and injuries. This issue focuses on recent technological developments, discoveries, and implementations, and highlights some procedures, processes, and treatments that represent important modalities of restorative functional and reconstructive neurosurgery.

We begin with a case report and review of the literature that demonstrates a very effective implementation of a multitarget deep brain stimulation intervention that elicited a dramatic and lasting effect in a patient with severe idiopathic hemidystonia (Goulenko et al.). This is followed

by a novel application of the contralateral C-7 nerve root transfer that supports a deviation from long-held peripheral nerve dogma, i.e., that a repair under tension should be avoided. The authors provide important support for the idea that avoidance of grafts in this clinical scenario proved more critical than avoidance of repair under tension (Bhatia et al.). Next, we explore the cost effectiveness of nerve transfers and free functional muscle transplants in the setting of a complete brachial plexus injury (Wali et al.); following, a thoughtful editorial explores the dramatic advances that have been made in the field of brain-machine interfaces (Hu et al.). Dr. Mandeville et al. then provide a sound argument for the critical role of neurophysiology in determining candidacy for nerve transfers to restore upper extremity function in the setting of chronic tetraplegia. Finally, a summary of the current “state of the science” in the clinical practice of paralysis reversal is provided, with case examples to illustrate the various concepts (Brown et al.). This final communication summarizes where we are as a discipline and provides a needed “call to action” to adopt this field as an important subspecialty within neurosurgery.

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Disclosures

Dr. Zafonte has served as a consultant to Myomo, Oxeia Biopharmaceuticals, and EIMindA.