

Evaluation of the Efficacy and Results of Intraoperative Nerve Conduction in Nerve Reconstruction of the Hand

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ABSTRACT

Nerve reconstruction in the hand is a critical aspect of hand surgery, aiming to restore sensory and motor function and improve overall hand functionality. Intraoperative nerve conduction, a neurophysiological technique, plays a pivotal role in nerve reconstruction surgeries. This literature review evaluates the efficacy and results of intraoperative nerve conduction in hand nerve reconstruction.

Theoretical Framework: Intraoperative nerve conduction involves electrical stimulation of nerve fibers and the recording of nerve conduction responses in real-time during surgery. The technique aids in nerve identification, assessment, and surgical decision-making.

Discussion: Intraoperative nerve conduction has shown efficacy in guiding surgical interventions and predicting postoperative outcomes. It has been particularly useful in complex nerve injuries, providing valuable feedback for optimal surgical planning.

Challenges: Despite its benefits, intraoperative nerve conduction has limitations, such as timing issues and the need for skilled neurophysiologists and specialized equipment.

Future Implications: Standardizing protocols and conducting larger prospective studies can enhance its reliability and identify specific scenarios where intraoperative nerve conduction provides the greatest benefit.

Conclusion: Intraoperative nerve conduction is a valuable tool in hand nerve reconstruction, contributing to improved patient outcomes and the advancement of hand surgery. Continued research and technological advancements hold promise for its further optimization and wider applicability in the field.

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INTRODUCTION

Hand injuries resulting in nerve damage are relatively common and can lead to significant functional impairment and disability. The hand is a highly intricate and delicate structure, consisting of an intricate network of nerves responsible for sensory perception and motor control. The prevalence of hand injuries varies across different populations, with higher incidence observed in certain occupational groups, such as manual laborers, athletes, and individuals engaged in high-risk activities.

According to epidemiological data, hand injuries account for a substantial proportion of all traumatic injuries, with nerve injuries being a significant component. The incidence of hand nerve injuries may differ based on geographical location, socio-economic factors, and the presence of high-risk industries in the area.

The hand plays a vital role in carrying out numerous activities of daily living, work-related tasks, and recreational pursuits. Nerve injuries in the hand can lead to various debilitating

consequences, such as loss of sensation, muscle weakness, and impaired fine motor skills. The functional deficits resulting from hand nerve injuries can severely impact a patient's quality of life, independence, and ability to engage in professional or leisure activities.

Nerve reconstruction of the hand has emerged as a critical aspect of hand surgery, aiming to restore sensory and motor function and improve overall hand functionality. The significance of nerve reconstruction in the hand lies in its potential to alleviate pain, restore hand strength and dexterity, and enhance patient satisfaction with functional outcomes.

Importance of Intraoperative Nerve Conduction in Nerve Reconstruction

Intraoperative nerve conduction is an advanced neurophysiological technique that has revolutionized nerve reconstruction surgeries of the hand. This technique allows surgeons to assess nerve conduction responses in real-time during the surgical procedure. By providing immediate feedback on nerve integrity and function, intraoperative nerve

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conduction aids surgeons in making informed decisions, optimizing surgical techniques, and potentially improving overall surgical outcomes.

Intraoperative nerve conduction is particularly valuable in cases of complex nerve injuries, where determining the viability of the nerve and selecting the most appropriate reconstruction approach can be challenging. It enables surgeons to evaluate nerve conduction across various sites, assisting in the identification of nerve injuries and guiding the choice of surgical interventions, such as nerve repair, grafting, or transfer.

The effectiveness of intraoperative nerve conduction in nerve reconstruction of the hand has garnered increasing interest among hand surgeons and neurophysiologists alike. However, comprehensive evaluations of its efficacy and the clinical impact on surgical outcomes are essential to further substantiate its benefits and optimize its utilization in hand nerve reconstruction.

Objectives of the Literature Review

This literature review aims to evaluate the efficacy and results of intraoperative nerve conduction in nerve reconstruction of the hand. By reviewing the existing literature and clinical evidence, we seek to determine the role of intraoperative nerve conduction in surgical decision-making, its impact on functional outcomes, and its potential limitations.

Understanding the theoretical framework and clinical implications of intraoperative nerve conduction in hand nerve reconstruction will provide valuable insights for healthcare professionals involved in hand surgery. The synthesis of current evidence will also identify areas for further research, helping to advance the field and enhance patient care in the realm of hand nerve reconstruction.

DEFINITION

Intraoperative nerve conduction is a neurophysiological technique used during nerve reconstruction surgeries in the hand. It involves the electrical stimulation of nerve fibers and the recording of their corresponding nerve conduction responses. The procedure provides real-time information about nerve integrity and functionality, allowing the surgical team to assess the status of the injured nerve during the operation.

Mechanism of Intraoperative Nerve Conduction

Intraoperative nerve conduction is based on the principles of neurophysiology and electrophysiology. During the procedure, an electrical stimulus is delivered to the injured nerve, and the resulting nerve conduction response is measured and analyzed. The recorded responses are displayed on a monitor, allowing the surgical team to evaluate the amplitude, latency, and waveform characteristics of the nerve action potentials.

Clinical Applications

Intraoperative nerve conduction is utilized in various scenarios during hand nerve reconstruction surgeries:

Nerve Identification: Intraoperative nerve conduction aids in the identification of injured nerves and their precise location within the surgical field. This is particularly valuable in cases where nerve injury is extensive or when scar tissue obscures the nerve's anatomical landmarks.

Nerve Assessment: The technique allows the surgeon to assess the viability and functionality of the injured nerve. By evaluating nerve conduction responses, the surgeon can determine whether the nerve can sustain successful surgical repair or if alternative reconstruction techniques, such as nerve grafting or nerve transfer, are necessary.

Surgical Decision-making: Intraoperative nerve conduction provides real-time feedback, enabling the surgeon to make critical decisions during the surgery. The data obtained from nerve conduction studies influence the choice of surgical technique, the extent of nerve repair, and the type of nerve graft used.

Surgical Outcome Prediction: Intraoperative nerve conduction responses are indicative of the nerve's capacity to conduct signals and potentially predict the postoperative functional outcomes. The information obtained assists in setting realistic expectations for patient recovery and rehabilitation.

DISCUSSION

Efficacy of Intraoperative Nerve Conduction

Intraoperative nerve conduction has demonstrated its efficacy as a valuable intraoperative tool in nerve reconstruction surgeries of the hand. By providing immediate feedback on nerve functionality, it enhances the precision of surgical interventions and contributes to better patient outcomes. Studies have shown that intraoperative nerve conduction is particularly useful in complex nerve injuries, where the nerve's condition may be uncertain.

Impact on Surgical Outcomes

The integration of intraoperative nerve conduction into hand nerve reconstruction surgeries has been associated with improved surgical outcomes. By ensuring accurate nerve identification and assessment, the technique assists surgeons in making evidence-based decisions, leading to more successful nerve repair and functional recovery.

Limitations and Challenges

While intraoperative nerve conduction is a valuable tool, it is not without limitations. Factors such as the timing of the nerve conduction study, the presence of scar tissue, and the accuracy of the nerve conduction responses may influence its reliability. Additionally, the technique requires skilled neurophysiologists and specialized equipment, which may not be readily available in all healthcare settings.

Future Directions and Research Implications

Continued research and technological advancements in intraoperative nerve conduction hold promise for further improving its efficacy and expanding its applications. Standardizing protocols for nerve conduction studies and

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establishing normative data are important steps to enhance the technique's reliability and reproducibility.

Moreover, larger prospective studies are needed to systematically evaluate the impact of intraoperative nerve conduction on patient outcomes and to identify specific scenarios where the technique provides the greatest benefit.

Conclusion

Intraoperative nerve conduction represents a significant advancement in hand nerve reconstruction surgeries. By providing real-time assessment of nerve function and viability, the technique aids in surgical decision-making and contributes to improved patient outcomes. While further research is needed to optimize its utility and address limitations, intraoperative nerve conduction holds great promise in advancing the field of hand nerve reconstruction, ultimately benefiting patients with nerve injuries and enhancing their quality of life.

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