

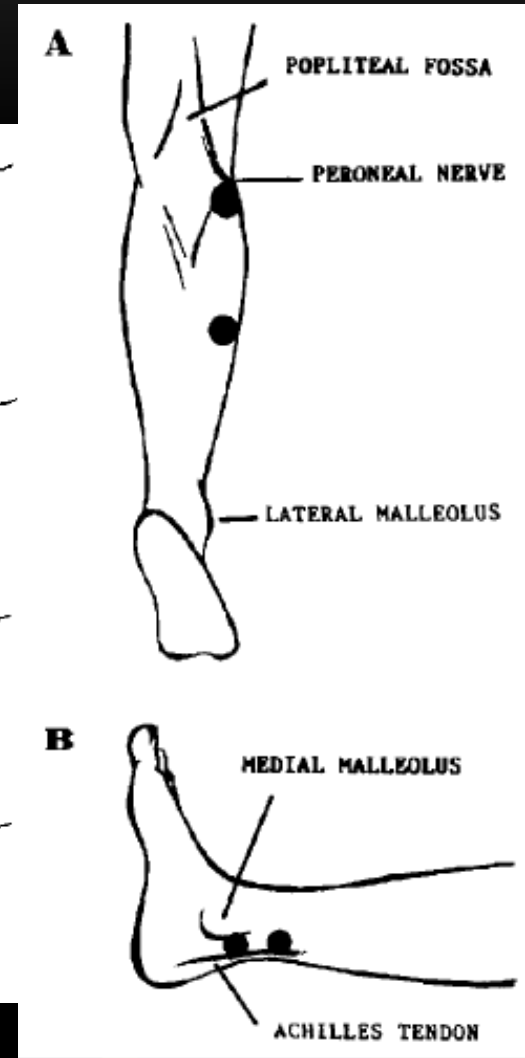
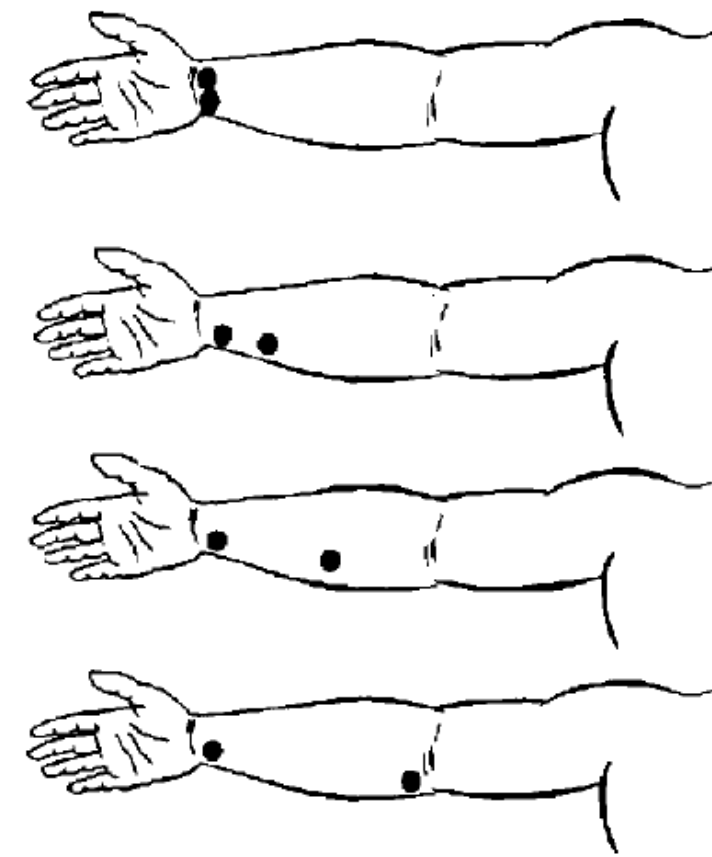
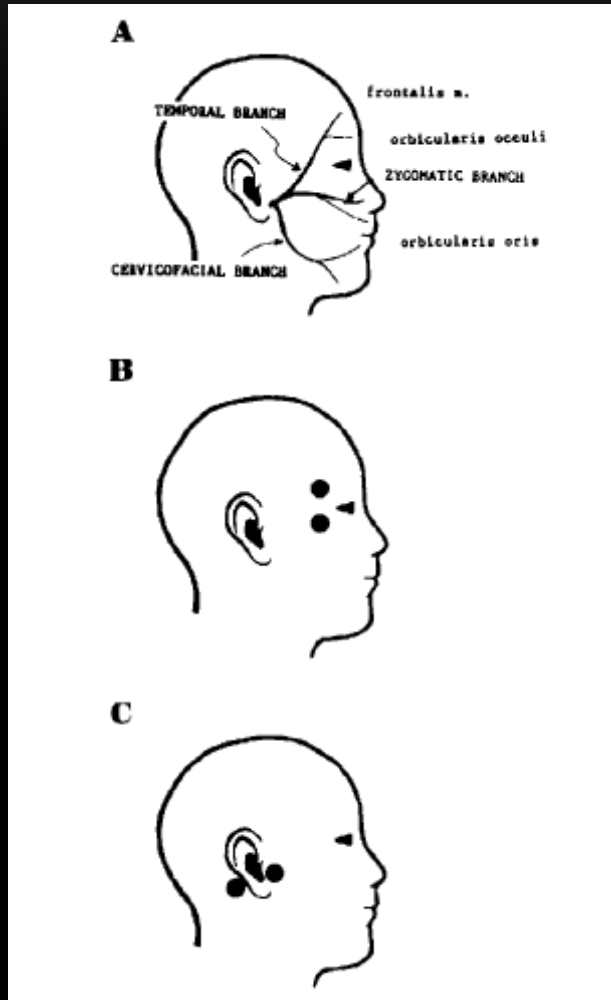
POST-OPERATIVE RESIDUAL PARALYSIS AND ACCELEROMYOGRAPHY

PRESENTED BY SRNA'S
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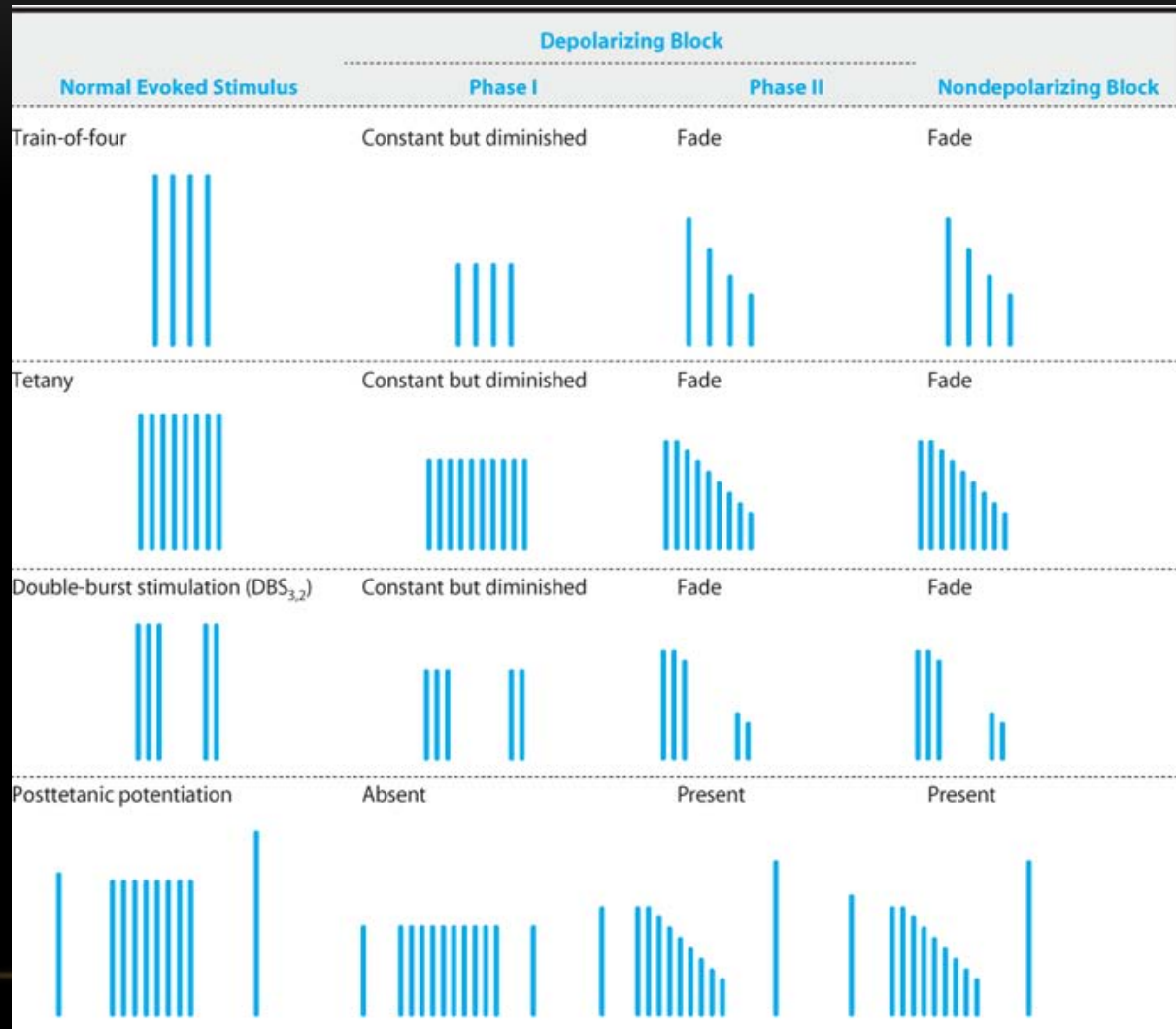
PRESENTATION OBJECTIVES

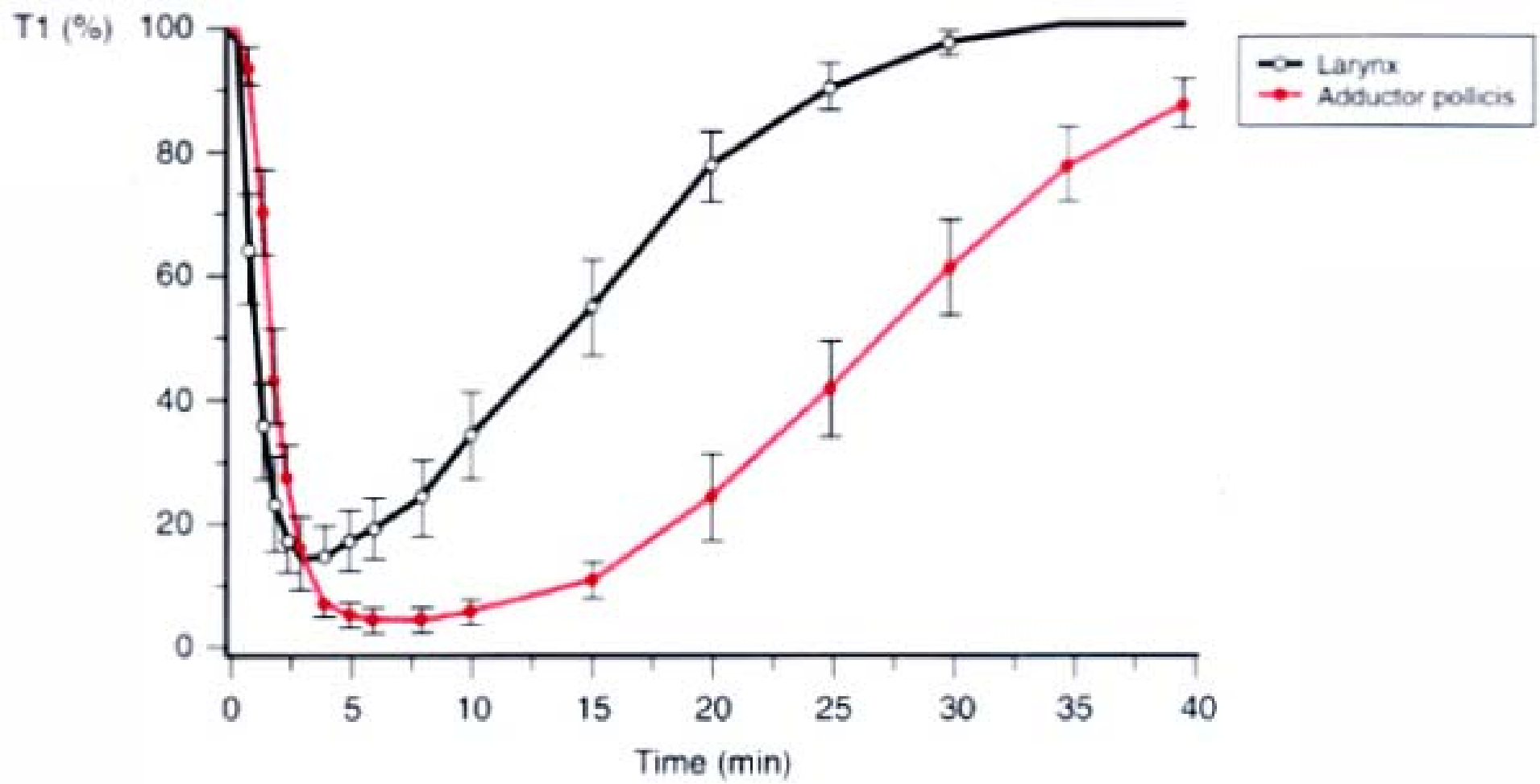
- DEFINE POST-OPERATIVE RESIDUAL PARALYSIS
- REVIEW OF PHYSIOLOGY
- REVIEW OF CURRENT MONITORING
- HOW ACCELEROMYOGRAPHY WORKS
- IDENTIFY RISKS ASSOCIATED WITH POST-OPERATIVE TRACHEAL RESIDUAL PARALYSIS
- CURRENT (MIS)PERCEPTIONS PREVALENT IN CLINICAL SETTING
- RESEARCH REVIEW
- CLINICAL IMPLICATIONS
- REAL LIFE SCENARIO

PERIPHERAL STIMULATOR ELECTRODE PLACEMENT

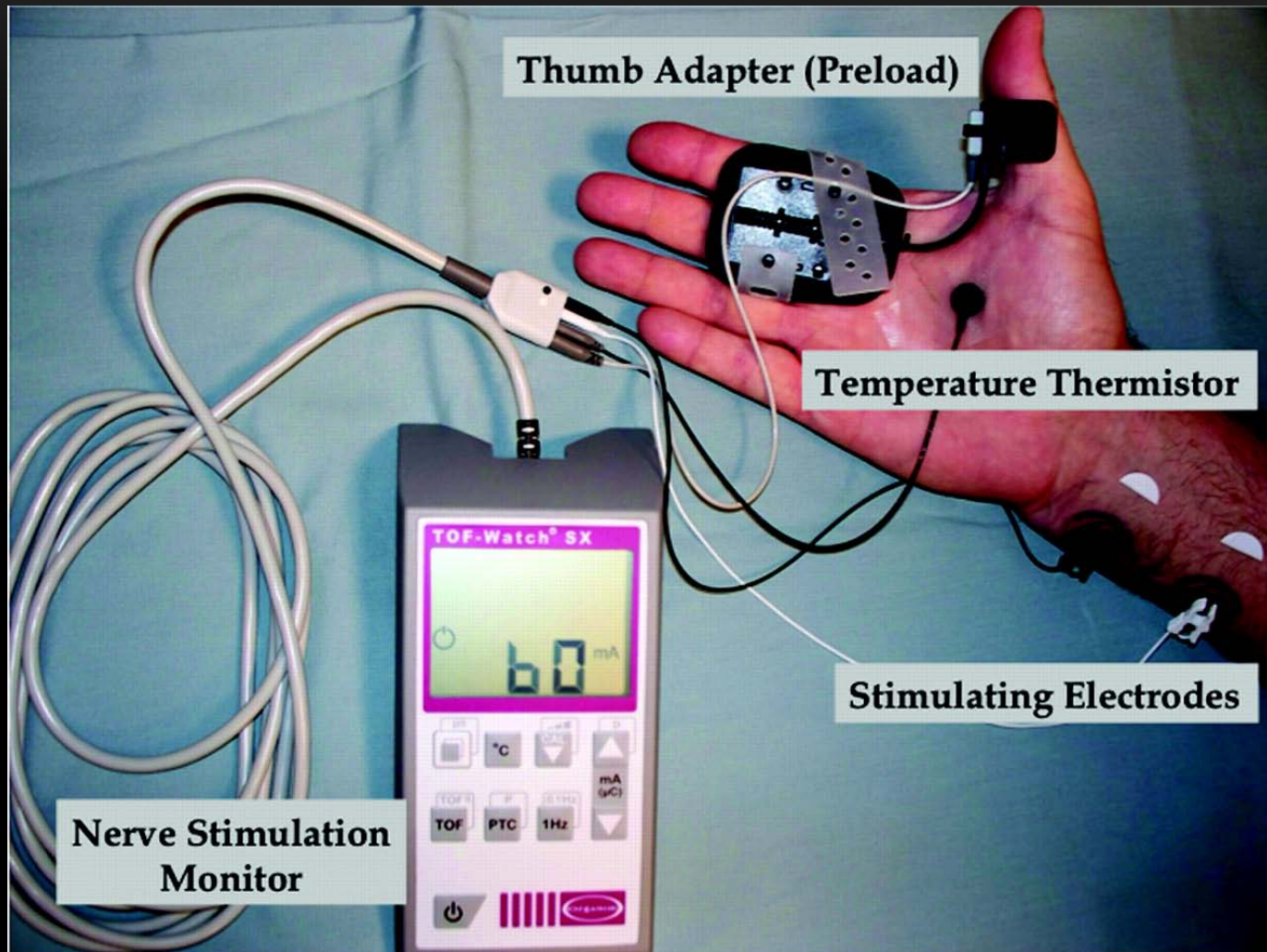


EVOKED RESPONSES DURING DEPOLARIZING AND NONDEPOLARIZING BLOCK





AN EXAMPLE OF ACCELEROMYOGRAPHY



Brull S J , Murphy G S Anesth Analg 2010;111:129-140

ANESTHESIA & ANALGESIA

RISKS ASSOCIATED WITH POST-OPERATIVE RESIDUAL PARALYSIS

- Train-Of-Four (TOF) ratios of 0.7-0.9 associated with
 - Impaired airway protective reflexes (SUNDMAN ET AL, 2000)
 - Upper airway obstruction (EIKERMANN ET AL, 2003)
 - Decreased hypoxic ventilatory response (ERIKSSON, 1993)
 - Postoperative hypoxemia (BESSINGER, 2000)

(MIS)PERCEPTIONS IN CLINICAL SETTING

- Lack of availability of **quantitative** monitors
 - 22.7% available to Americans
 - 70.2% available to Europeans
- In the U.S., 68.2% of respondents reported that clinical signs (such as the ability to sustain a 5-s head lift) were reliable indicators of the adequacy of neuromuscular recovery.
 - *This trend being especially pronounced among those who had 6-10 years of experience and those practicing at university hospitals (Naguib et al, 2010)

(MIS)PERCEPTIONS...

- Head Lift for 5 seconds
 - Can be achieved with a ratio of less than 0.6
- Subjective interpretation of train-of-four monitoring
 - Misinterpretation of fade
 - Experienced clinicians are unable to determine accurate ratio from 0.4-0.9 with conventional nerve stimulators (CAPRON ET AL, 2006)
- Train-of-four in face
 - Orbicularis Oculi recovery corresponds with airway muscles
 - Return occurred 17 minutes before similar degree of recovery was noted at the thumb (adductor pollicis)

(MIS)PERCEPTIONS...

- 19.3% of Europeans and 9.4% of Americans never use neuromuscular monitors
- “Most respondents reported that neither conventional nerve stimulators nor quantitative train-of-four monitors should be part of minimum monitoring standards.”
(Naguib et al, 2010)

AANA STANDARD OF CARE

- STANDARD V
 - Monitor the patient's physiologic condition as appropriate for the type of anesthesia and specific patient needs.
 - E.) Monitor neuromuscular function and status when neuromuscular blocking agents are administered

AMERICAN SOCIETY OF ANESTHESIOLOGISTS (ASA)

- Published Standards for Basic Anesthetic Monitoring (last amended by the House of Delegates in October 2005), ASA without established standard regarding neuromuscular blockade.
- Report of ASA Task Force on Postanesthesia Care stated, “Assessment of neuromuscular function primarily includes physical examination and on occasion may include neuromuscular monitoring.” (Silverstein et al, 2002)

HIGHLIGHTS FROM RESEARCH

- 35% at risk for POST-OPERATIVE RESIDUAL PARALYSIS IN PACU
 - (16-42%), (33-64%)
- 0.8% will have CRITICAL RESPIRATORY EVENTS
- 0.05% will require EMERGENCY RE-INTUBATION

(MURPHY ET AL, 2008)



THE CLINICAL IMPLICATIONS

- 55 MILLION General Anesthesia Cases each year (CDC, 2009)
 - 20 MILLION exposed to muscle relaxants
- 7 MILLION patients at risk for POST-OPERATIVE RESIDUAL PARALYSIS
- 160,000 patients will have CRITICAL RESPIRATORY EVENTS
- 10,000 patients will require EMERGENCY RE-INTUBATION
- Assuming 20-30 thousand operating rooms in the US
 - 1-2 occurrences at OUR hospital EVERY YEAR

REAL LIFE SCENARIO

- Surgical closure after upper abdominal surgery on an elderly gentleman. He received full dose reversal after “train-of-four” (TOF) was documented without fade. Pt subsequently extubated and brought to PACU with minimal expiratory effort and low Oxygen saturation of 88% and hyperdynamic circulation indicative of hypercarbia.
- Reassessment in PACU at the ulnar nerve with acceleromyography revealed TOF ratio of 0.36. Further investigation revealed that assessment consisted of TOF (visual assessment) of the face muscles (jaw) and confirmation of “sustained tetanus” (delivery for approximately 2 seconds) through electrodes placed on the pt’s temple and forehead. (The Normalization of Deviance...)

SUBJECTIVE “MONITORING”

Subject to **FAILURE**



OUR PATIENTS ARE TOO IMPORTANT



REFERENCES

- Brull, S.J., Murphy, G.S. (2010). Residual Neuromuscular Block: Lessons Unlearned. Part I: Definitions, Incidence, and Adverse Physiologic Effects of Residual Neuromuscular Block. *Anesthesia & Analgesia*. 111(1), 129-140.
- Brull, S.J., Murphy, G.S. (2010). Residual Neuromuscular Block: Lessons Unlearned. Part II: Methods to Reduce the Risk of Residual Weakness. *Anesthesia & Analgesia*. 111(1), 129-140.
- Hudes, E. & Lee, K. (1987) Clinical use of peripheral nerve stimulators in anaesthesia. *Canadian Journal of Anesthesia / Journal canadien d'anesthésie*. 34:5 525-534.
- Morgan, G.E., Mikhail, M.S. & Murray, M.J. (2006). *Clinical Anesthesiology 4th Edition*. New York. McGraw Hill Companies Inc.
- Murphy, G.S, Brull, S.J. (2010). Residual Neuromuscular Block: Lessons Unlearned. Part I: Definitions, Incidence, and Adverse Physiologic Effects of Residual Neuromuscular Block. *Anesthesia & Analgesia*. 111(1), 120-128.
- Murphy, G.S., Szokol, J.W., Marymont, J.H., Franklin, M., Avram, M.J., Vender, J.S. (2005) Residual Paralysis at the time of Tracheal Extubation. *Anesthesia and Analgesia*. 100:1840-5.

References

- Prielipp, R.C., Magro, M., Morell, R.C. & Brull, S. (2010) The Normalization of Deviance: Do we (Un)knowingly Accept Doing the Wrong Thing? *Anesthesia and Analgesia*. 110: 5 1499-1504.
- Stoelting, R.K. & Miller, R.D. (2007) *Basics of Anesthesiology*, 5th Edition. Philadelphia. Churchill Livingstone Elsevier. (563-579)
- *THE ROLE OF THE NEUROMUSCULAR JUNCTION IN MUSCLE CONTRACTION* . (2002). Retrieved March 1, 2012, from http://thebrain.mcgill.ca/flash/a/a_06/a_06_m/a_06_m_mou/a_06_m_mou.html