PainWeek®

Post-Surgical Neuralgia: Diagnosis and Treatment

Alaa Abd-Elsayed, MD, MPH, FASA

Title & Affiliation

Alaa Abd-Elsayed, MD, MPH, FASA
Medical Director, UW Health Pain Services
Medical Director, UW Pain Clinic
Division Chief, Chronic Pain Medicine
Associate Professor of Anesthesiology
University of Wisconsin, Madison

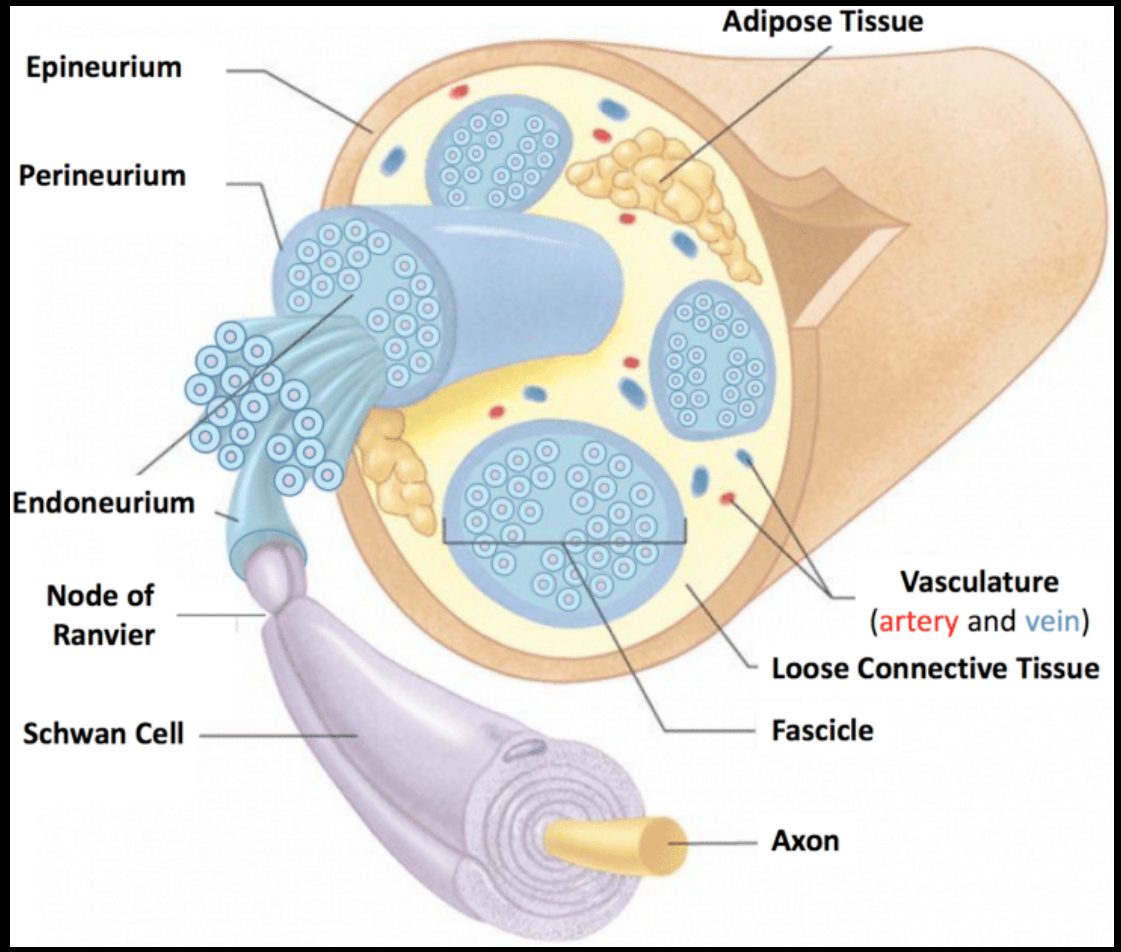
Disclosure

- Consulting Fee (eg, Advisory Board): Medtronic and Avanos
- Contracted Research (Principal Investigators must provide information, even if received by the institution): Medtronic

Learning Objectives

- Describe the pathology of postoperative neuralgia
- List the risk factors of postoperative neuralgia
- Describe diagnosis of postoperative neuralgia
- Explain treatment of postoperative neuralgia

Nerve Anatomy

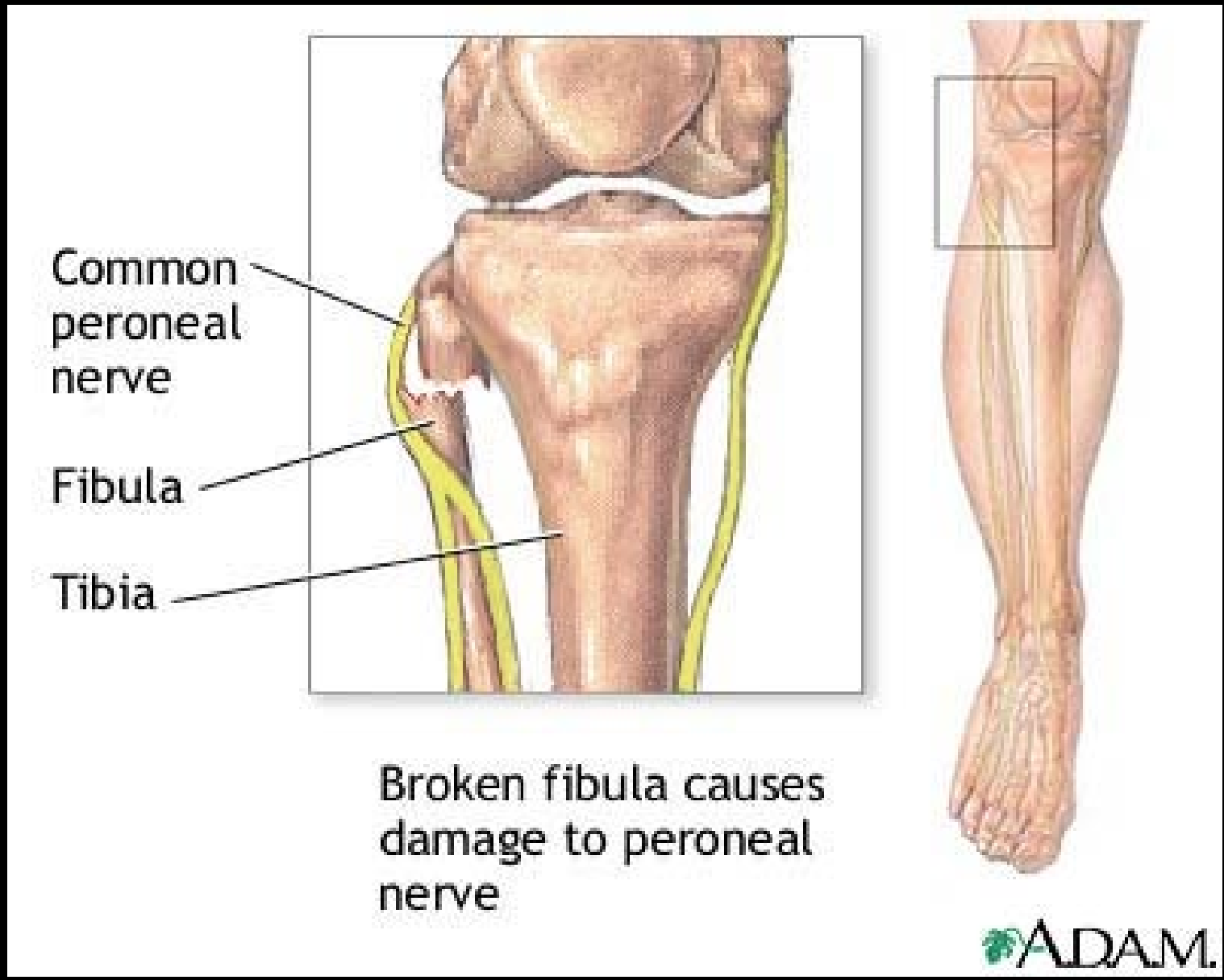


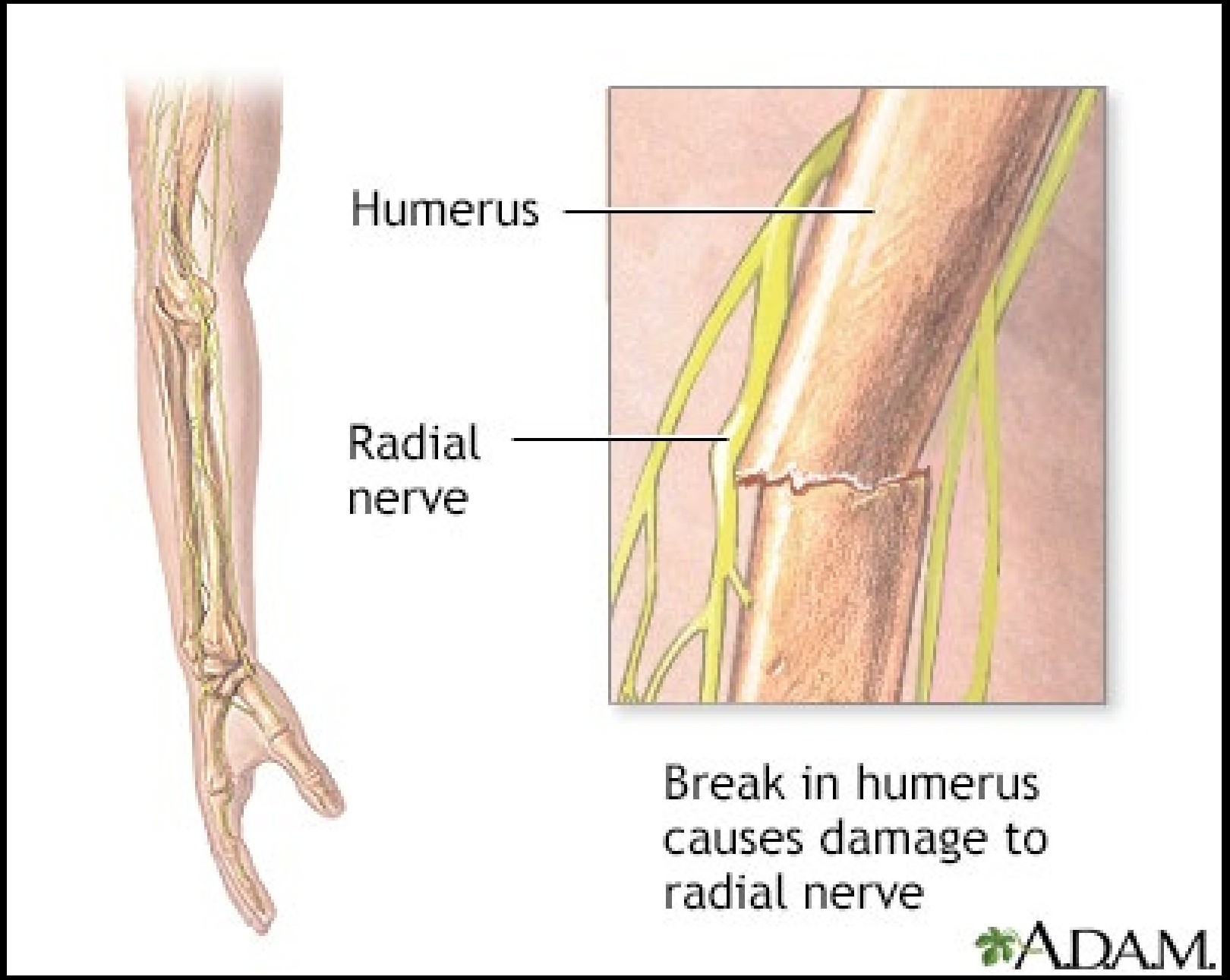
Mechanisms and Pathophysiology of Nerve Injury

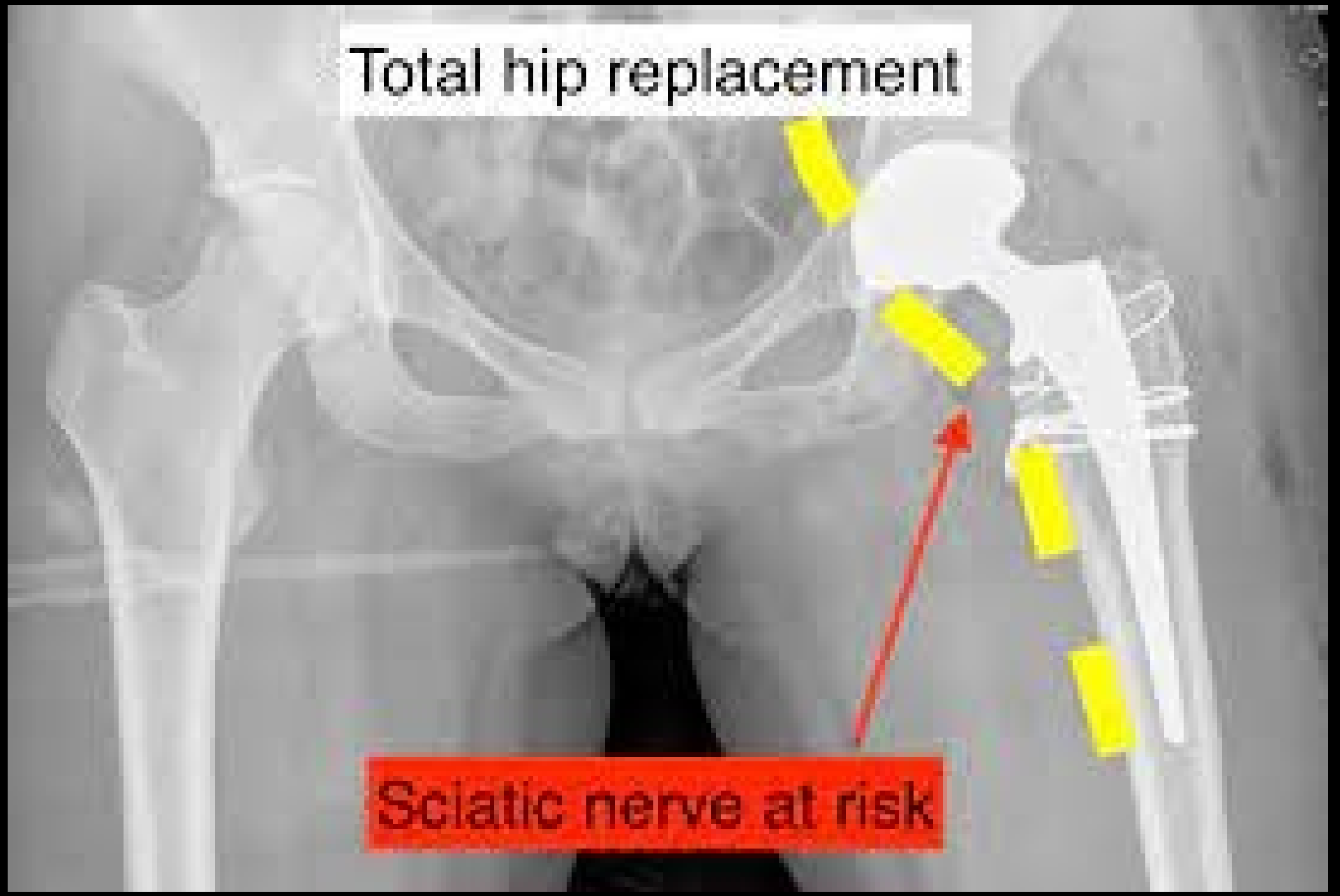
Peripheral Nerve Injuries

Peripheral nerve injuries can occur due to:

- **Mechanical factors**
  - Stretch
  - Crush
  - Transection
  - Pressure
- **Inflammatory neuropathies**
  - Inflammation
  - Immune factors


Common peroneal nerve
Fibula
Tibia
Broken fibula causes damage to peroneal nerve
A.D.A.M.


Humerus
Radial nerve
Break in humerus causes damage to radial nerve
A.D.A.M.


Total hip replacement
Sciatic nerve at risk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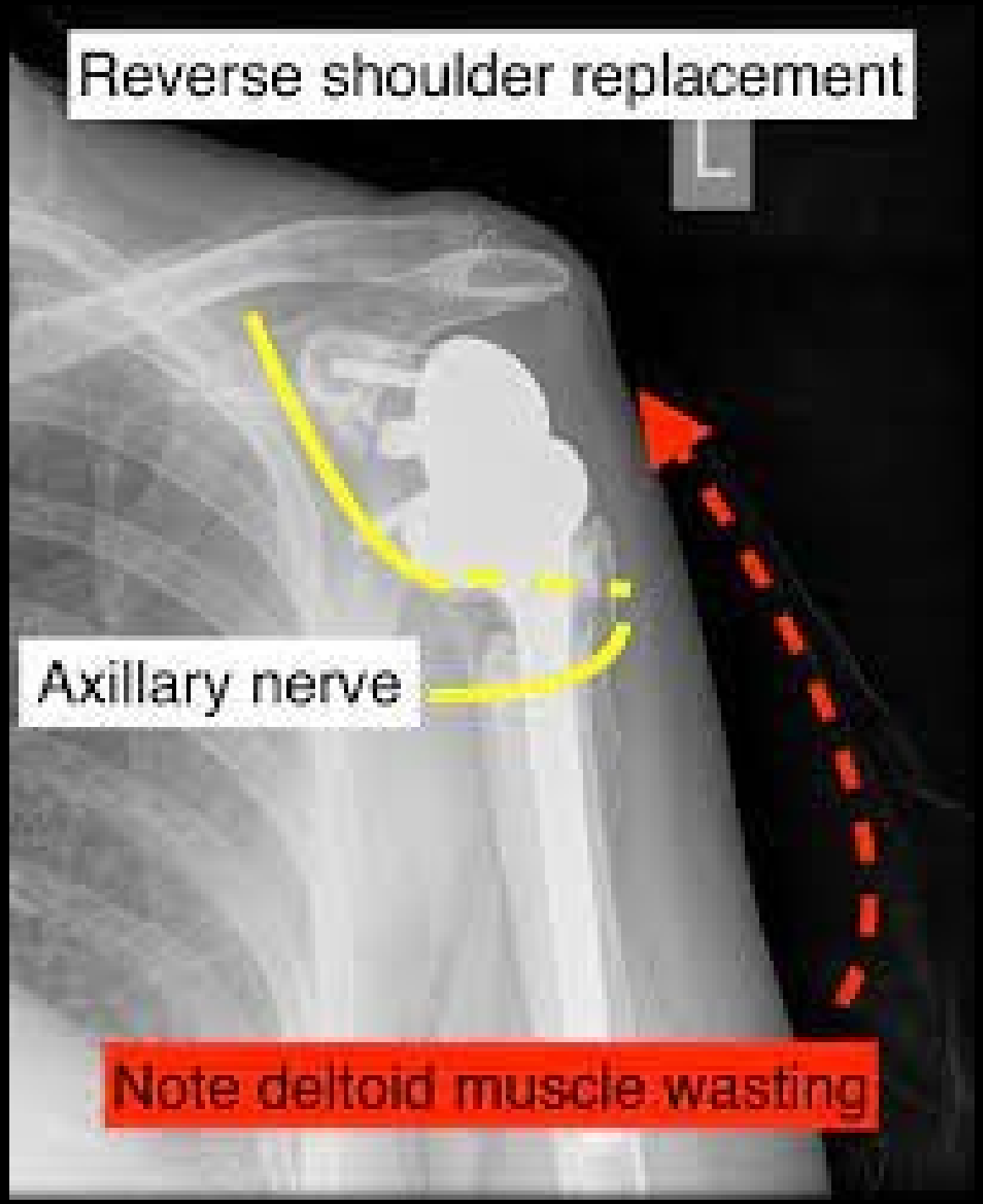
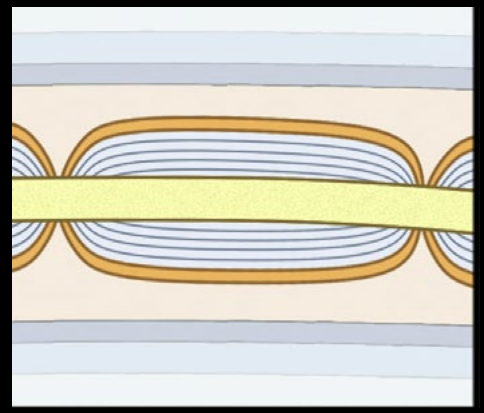

Reverse shoulder replacement
L
Axillary nerve
Note deltoid muscle wasting

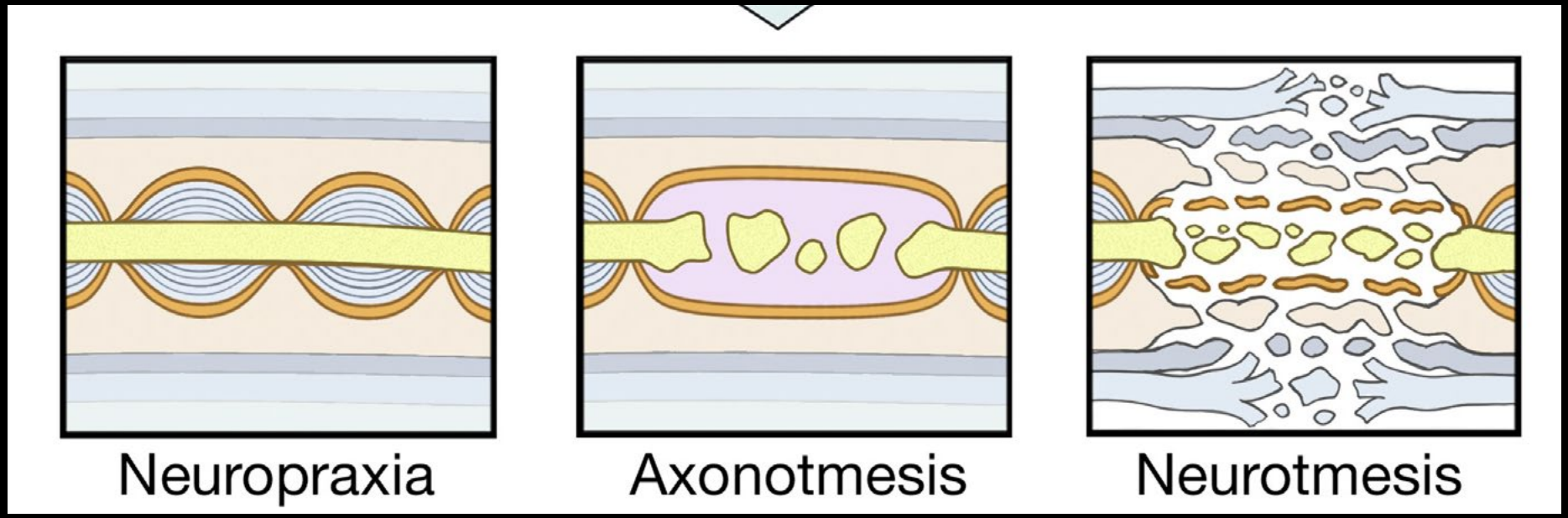

Humeral shaft fracture
Radial nerve at risk!

Cause:

Surgery or Anesthesia?

Recovery from Perioperative Peripheral Nerve Injuries




Neuropraxia
Axonotmesis
Neurotmesis

Nerve Injuries

Nerve injuries are classified in order of severity as:

- Neuropraxia—impaired action potential conduction due to focal demyelination or ion channel dysfunction. Quick recovery with good prognosis
- Axonotmesis—a discontinuity in the axon leading to distal nerve Wallerian degeneration. Slower recovery
- Neurotmesis—a discontinuity through the nerve, including the epineurium and connective tissue. Will only recover with surgical reconnection

Nerve Injuries (continued)

- In the cases where axonal degeneration occurs, prognosis is critically dependent on the distance from the site of injury and the nerve targets (skin or muscle)

- For example, recovery of the median nerve at the carpal tunnel will be faster than if the injury is at the brachial plexus

Considerations in Postsurgical Neuropathies

- Neuropathies after anesthesia are generally related to positioning
- Other proposed tissue stretch and ischemic compression
- Surgical duration is also a concern
- Sometimes it happen long after surgery

Risk Factors

- Male sex
- Body habitus (both extremes)
- Pre-existing neurologic symptoms
- Diabetes mellitus
- Peripheral vascular disease
- Alcohol dependence
- Tobacco use
- Arthritis
- Ascertain whether joint ranges of motion allow for anticipated operative position

Positioning

- Limit extreme positions
- Periodic perioperative assessment
- Protective padding
- Postoperative physical assessment

Postsurgical Inflammatory Neuropathy

Etiology

- Etiology may remain unclear
  - It can happen long after surgery
  - There may be no identifiable risk factors
  - It can happen far from site of surgery

Neuropathic Symptoms Post-Surgery

- Parsonage and Turner
  (12/136 patients developed neuropathic symptoms 3-14 days after surgery)
- Another study reported an incidence of 13.9% “idiopathic”
- Staff et al studied patients who developed neurologic deficit within 30 days after surgery and performed a nerve biopsy
  - Inflammatory neuropathy
  - Incomplete recovery
  - Clinical improvement with immunotherapy

Postsurgical Neuropathies by Surgical Procedure

Cervical Spine Surgery

- Highest in cervical spine surgery
- C5 palsy
- Less common with anterior approach

A projection study using data from the United States Census together with the Nationwide Inpatient Sample predicts that the number of TKAs will reach 3.48 million by 2030 (634% increase) and that of primary THAs to reach 572,000 (174% increase).

Hip Surgery

- 111 of 563 THA-related claims filed were due to “nerve” damage
- Incidence in different studies range between 0.7%-3%
- Peroneal division being the most involved

- Farrell et al indicated that only 55% of patients had identifiable etiology
- 72 months follow up, 45% of patients continued using a gait aid

Weber et al prospectively evaluated 28 patients (30 hip surgeries) via EMG 24 hours before and 18 to 21 days after THA. 70% of patients had changes on EMG that were not present preoperatively, but notably the EMG findings were subclinical in nature in 90%.

In conclusion,

it can happen after any surgery

Regional anesthesia and nerve blocks

No clear evidence

Features Favoring Inflammatory Nature

- Delayed onset
- Progressive pain and weakness
- Weakness outside the expected distribution
- Severe neuropathic pain
- Improvement in the first month

Treatment

Etiology Helps Guide Treatment

- Staff et al (17/ 21 patients) and Laughlin et al (5/6 patients) received immunotherapy administered as 12 weekly doses of 1 gm intravenous methylprednisolone

In both series, all patients improved with regard to their neuropathy-related impairment, including the patients who did not receive immunotherapy. This finding stresses that this condition is likely a monophasic, improving condition.

When Chronic

- Nonpharmacological modalities as PT
- Pharmacological modalities
- Interventions, as blocks, steroid injections, RFA, stimulation and more

Litigations

Major Concerns

- Postsurgical neuropathy is a major concern especially if leads to loss of function
- Peripheral nerve injury is reported to be the third most common cause of anesthesia related litigations
- Peripheral nerve injuries represented 14% of filings during the 1990s, 10% from 2000 to 2009, and only 7% from 2010 to 2013
- Of the identifiable causes during general anesthesia, positioning was most common (30%) among the claims followed by surgical factors (7%) and exacerbation of pre-existing neuropathy (6%)
- In 90% of the claims analyzed, anesthesia care was deemed appropriate

References

- Staff NP, Engelstad J, Klein CJ, et al. Post-surgical inflammatory neuropathy. Brain. 2010;133(10):2866-2880.
- Hoffman EM, Staff NP, Robb JM, St Sauver JL, Dyck PJ, Klein CJ. Impairments and comorbidities of polyneuropathy revealed by population-based analyses. Neurology. 2015;84(16):1644-1651.
- Parsonage MJ, Turner JW. Neuralgic amyotrophy; the shouldergirdle syndrome. Lancet. 1948;1(6513):973-978.
- Kern MJ, Murray RS, Sherman TI, Postma WF. Incidence of nerve injury after hip arthroscopy. J Am Acad Orthop Surg. 2018;26(21):773-778.
- Navarro RA, Schmalzried TP, Amstutz HC, Dorey FJ. Surgical approach and nerve palsy in total hip arthroplasty. J Arthroplasty. 1995;10(1):1-5.
- Farrell CM, Springer BD, Haidukewych GJ, Morrey BF. Motor nerve palsy following primary total hip arthroplasty. J Bone Joint Surg Am. 2005;87(12):2619-2625.

References

- Sierra RJ, Beaule P, Zaltz I, et al. Prevention of nerve injury after periacetabular osteotomy. Clin Orthop Relat Res. 2012;470(8): 2209-2219.
- Weber ER, Daube JR, Coventry MB. Peripheral neuropathies associated with total hip arthroplasty. J Bone Joint Surg Am. 1976;58(1):66-69.
- Lalkhen AG, Bhatia K. Perioperative peripheral nerve injuries. Cont Educ Anaesth Crit Care Pain. 2012;12(1):38-42.
- Chui J, Murkin JM, Posner KL, Domino KB. Perioperative peripheral nerve injury after general anesthesia: a qualitative systematic review. Anesth Analg. 2018;127(1):134-143.
- Kent CD, Stephens LS, Posner KL, Domino KB. What adverse events and injuries are cited in anesthesia malpractice claims for nonspine orthopaedic surgery? Clin Orthop Relat Res. 2017; 475(12):2941-2951.
- Unwin A, Scott J. Nerve palsy after hip replacement: medicolegal implications. Int Orthop. 1999;23(3):133-137.

ABDELSAYED@WISC.EDU

Thank You!