SIRVA/Rhabdomyolysis Following Second mRNA SARS-CoV-2 Vaccination

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History

• A 35-year-old left hand dominant female PT complaining of acute right shoulder/arm pain and swelling following second mRNA SARS-CoV-2 vaccine

• Received her second dose of the mRNA in her right deltoid 7 days prior. That night, she noticed progressively worsening pain of the deltoid as well as swelling in the deltoid and axillary region.

• She noted substantial amount of diffuse swelling from the shoulder/axillary region distally to the mid forearm which she attempted to treat with ibuprofen, antihistamine, and compression/heating wraps.
History

- At time of presentation, her reported swelling had progressively improved
- Continued to have pain in the upper arm, leading to reduced shoulder range of motion
- Pain rated as a 3/10 at rest, and 5-6/10 during activity
- Denied prior issue with the right shoulder or recent trauma
- Denied numbness or tingling in the arm
Physical Exam

- Right upper extremity: nonfocal tenderness across the proximal mid-belly bicep, anterior and mid deltoid, and triceps
- Neurovascularly intact, including AIN/PIN testing
- No palpable fluctuance or hematoma along the deltoid
- Bilateral upper extremity myotome assessment and dermatome assessment were intact
- Passive ROM of right shoulder: flexion 0–120, abduction 0–100
  Active ROM: flexion 0–100, abduction 0–60, external rotation 45º with strength intact.
What is SIRVA?

- Shoulder Injury Related to Vaccine Administration (SIRVA) is a known complication of improper technique of injecting vaccinations
- Involves injection of a vaccine into the shoulder capsule/subacromial bursa rather than the deltoid muscle
- Specific impairments include bursitis, bone erosion, and damage to the rotator cuff and bicipital tendons
- Hypothesized that an inflammatory response to vaccine contents in tissues other than the muscle may be causative
- Leads to pain, decreased range of motion, and a decreased quality of life
What is SIRVA?

- Can occur with any vaccine injection
  - Influenza vaccine is most often reported to VAERS
    - Most common vaccine administered in the United States, with ~150 million doses distributed annually
- Median time from vaccination to seeking healthcare = 15 days
  - Symptoms typically begin within 48 hours of injection
    - ~94% complain of shoulder pain
- Tenderness to palpation and loss of ROM are common
- Usually a clinical diagnosis, testing generally negative
- Very common for patients to have excessive testing performed
SIRVA Reports

Review of petitioner claims of SIRVA from 2010-2016 to the National Vaccine Injury Compensation Program (VICP)

- 476 claims reviewed
  - Increased throughout the time span, with just 2 reported in 2011, to 227 in 2016
- 400 cases (84%) involved influenza vaccine
- Pharmacy or store was the most common place of vaccination (35.3%) followed by doctor’s office (30.9%).
- Median age ~51 years, >80% women, and median BMI 25.1
- 60.1% had at least one steroid injection, and 32.6% had surgery
Too High
- Risk of injecting into shoulder joint or bursa
- Can cause inflammation leading to bursitis, frozen shoulder syndrome, and other complications
- Watch for prolonged shoulder pain, weakness, and decreased range of motion
- Symptoms begin within hours to days
- Without treatment, symptoms last months and may never resolve

Too Far to Side
- Can inject into axillary nerve
- Can cause paralysis and/or neuropathy
- Watch for burning, shooting pain during injection
- Symptoms start immediately

Too Low
- Can inject into radial nerve

What happens when:

Needle Too Short
- Can inject into subcutaneous tissue
  - More painful for patient
  - Risk of skin reaction
  - Vaccine may be less effective

Needle Too Long
- Can hit bone or nerve
  - If you hit bone, pull needle back slightly and inject
  - If you hit nerve, pull needle out and try again

Tips to Avoid SIRVA

Landmark, don’t “eyeball”
Always sit to inject a seated patient

Expose the shoulder completely
When a shirt can’t be removed, roll the sleeve up, don’t pull the shirt’s nuck over the shoulder

Remember!
2-3 fingers down from the acromion

References:
CDC guideline for intramuscular administration

- Insertion of needle 90 degrees to surface of skin overlying the deltoid
- Needle length depends on age
  - 12 months – 2 years- 5/8 inch needle
  - 3 -18 years – 5/8 – 1 ¼ inch needle
  - Adults – 5/8 – 1 ½ inch needle
Rhabdomyolysis

- Rapid damage to skeletal muscle
- Breakdown products are quickly released into blood stream
  - Creatine phosphokinase (CPK/CK) and serum myoglobin (Mb)
- Usually secondary to infection, drugs, toxins, injury, or another external cause
- Can cause acute renal failure, fatal heart rhythm disturbances, hypovolemic shock, disturbances of electrolyte balance, metabolic acidosis, hyperthermia, disseminated intravascular coagulation
- Swelling of the damaged muscle occasionally leads to compartment syndrome
Causes of Rhabdomyolysis

Acquired
- Drugs / Toxins
- Ethanol
- Infectious / Sepsis
- Extreme Physical Exertion
- Crush Injury / Compartment Syndrome
- Ischaemia
- Metabolic Disturbance
- Primary Neurological disorders
  - e.g. status epilepticus, status dystonicus
- Idiopathic

Genetic
- Metabolic Muscle Disorders
  - Disorders of fatty acid metabolism (VLCAD deficiency, CPTII deficiency, glutaric aciduria type II, MAD deficiency) and disorders of glycogen metabolism (GSD type V, VII, IX, X, XI, XII, XIII, XIV)
- Mitochondrial Disorders
  - Complex I, complex II, cytochrome b (complex III), complex IV, tRNA mutations: 3243A>G/T in tRNAleu; 4298G>A in tRNAile; m.4281A>G in tRNAile), and DGUOK
- Disorders of intramuscular calcium release and excitation-contraction coupling:
  - RYR1
- Miscellaneous
  - SIL1, TSEN54
- Muscular Dystrophies
  - Dystrophinopathies (DMD/BMD), ANOS and LGMD (DYSF, FKRP), alpha-sarcoglycanopathy

Anaesthesia
- Malignant hyperthermia
- Muscle channelopathies
- Propofol Infusion Syndrome
Diagnosing Rhabdomyolysis

• Levels above 1000 U/L (5 times the upper limit of normal) indicate rhabdomyolysis
  – Elevates in the first 12 hours after the onset of rhabdomyolysis, peaks within the first 3 days, and returns to the baseline level at 3-5 days after the injury
  – Risk of renal injury is low when initial CK levels are lower than 15,000-20,000 U/L

• Hyperuricemia common

• Urinalysis may reveal dark, “tea-colored” urine
  – Myoglobin in urine is specific for the diagnosis of rhabdomyolysis
Differential Diagnosis

- SIRVA
- Rhabdomyolysis
- Rotator cuff strain/tear
- Axillary nerve injury
- Hematoma
- Local muscle infarct
Labs

- BMP demonstrated creatinine 0.77 mg/dL, BUN 18 mg/dL.
  - Electrolytes within normal limits.
- Creatine kinase 1,303.
- Urinalysis demonstrated no proteinuria or hematuria.
Imaging

- Limited nonvascular MSK ultrasound evaluation of the lateral shoulder obtained revealed no abnormal echogenicity of the deltoid fibers, no apparent hematoma, fluid collection, or tearing.
Diagnosis/Treatment

- SIRVA with Rhabdomyolysis
- Non-operative treatment
  - PO fluids
  - Home exercise program to work on ROM
  - Avoiding high intensity UE exercise
  - Avoid NSAIDs
  - Remain off work
Outcome and Follow Up

• On follow up 5 days later, reported no interval trauma or new complaints
• Swelling was slowly improving
• Pain and function improved by approximately 50% since initial visit
• Compliant with hydration and urinating without issue
• Continued to work on range of motion exercises at home
• Avoiding NSAIDs
• Repeat creatine kinase level 329
• She then followed up an additional 5 days later. At that time, reported she was near her baseline
Return to Activity

- She was cleared to return to work 3 weeks after initial injury
  - Requires no restrictions to function as PT
Conclusion

• Since 2010, claims of SIRVA to the National Vaccine Injury Compensation Program (VICP) have been increasing
  – Better understanding of SIRVA and increased utilization of reporting systems
• Teaching proper vaccine administration technique important to prevent future cases
• Important to keep in mind for patients with shoulder pain after vaccine administration
  – Especially in these times of so many unknowns with the SARS-CoV-2 vaccinations
• Treatment is conservative
  – Early recognition can save the patient excessive testing
References


• Bancsi, Ashley et al. “Shoulder injury related to vaccine administration and other injection site events.” Canadian family physician Medecin de famille canadien vol. 65,1 (2019): 40-42.
Thank You!

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