

This podcast can be accessed at www.pedscases.com, Apple Podcasting, Spotify, or your favourite podcasting app.

PODCAST TITLE

Developed by Dr. Kai Homer for PedsCases.com.
Sept, 17th, 2023

Introduction:

Title Slide:

Hi, my name is Dr. Kai Homer, and I'm a resident in Radiology at the University of Alberta. This video is the second in a series discussing musculoskeletal radiology in children. We're going to focus on musculoskeletal injuries, and going through some cases to help you understand how radiology fits into the whole clinical picture. This first video will discuss terminology used to describe fractures in radiology, focusing on some concepts that are specific to pediatrics.

This module was reviewed by Dr. Adrienne Thompson, a pediatric radiologist at the University of Alberta. I'd like to thank the University of Alberta Department of Radiology for allowing access to images from real cases. All images have been de-identified and are used here for educational purposes only. These slides are available at www.pedscases.com and on the Canadian Association of Radiologists website.

After watching this video, the learner should be able to:

1. Describe the five types of Salter-Harris fractures
2. Use the SALTR mnemonic to remember the types of Salter-Harris fractures
3. Identify the clinical complications of untreated Salter-Harris fractures

You may have already learned about the Salter-Harris fracture classification. This is a system used to classify different types of fractures involving the growth plate in the pediatric population. Here, I'd like to go over an easy mnemonic to help you remember how to use the Salter-Harris system in real life.

The easiest way to remember this that I have found is to use the name Salter, and make an acronym out of the letters S-A-L-T- and R. These letters correspond to the five types of SH fractures.

But, wait a sec, before I launch into the mnemonic, you're probably wondering what the point of the SH classification even is. Basically, kids get their own special fracture classification system to describe fractures that go through the growth plate. These

Developed by Dr. Kai Homer for PedsCases.com.
Sept, 17th, 2023

fractures are important clinically because any fracture that disrupts the growth plate can compromise the blood flow to the growth plate. This can lead to premature closure of the growth plate, which can in turn lead to problems such as limb-length discrepancies, or radioulnar joint arthritis. And if these problems develop, invasive surgery is usually required to help manage these kids symptoms. That is why SH fractures are important to catch and treat appropriately at the get go.

The letters will stand for the following terms: Straight Across, which corresponds to SH fracture type 1, Above, which corresponds to SH fracture type 2, Lower, for type 3 Through, for type 4 and Rammed, for type 5. I'll explain why these make sense in a second.

What's important to realize is that every type of Salter-Harris fracture, 1 through 5, all somehow involve the fracture going through the growth plate. The numbers help differentiate, for example, what other parts of the bone the fracture goes through, the angle at which the fracture line sits, etc.

In Salter Harris I fractures, the fracture line goes straight across the physis, and by definition does not involve the metaphysis or epiphysis. Here, in the schematic you can see the fracture line completely horizontal, going straight across (which is the S from our acronym) the growth plate. In reality, the fracture line may not be completely perfectly horizontal, this is just to illustrate the concept.

This slide (68) helps conceptualize the remaining types 2-5 of SH fractures that we are going to go through. All five types involve the physis, but different structures are affected other than the physis, depending on the type. SH 2 fractures refer to fractures involving the physis where a corner of the metaphysis is also broken off. SH 3 fractures describe when the fracture line extends from the physis into the epiphysis. SH 4 fractures describe when the fracture line extends through both the epiphysis and metaphysis, therefore crossing through the physis, which is the layer sandwiched in between the epiphysis and metaphysis. SH 5 fractures are unique in that actually it is only the physis affected, but the mechanism is specific to SH 5 fractures. If the fracture line doesn't go outside the physis, a crush mechanism by definition makes them SH 5 fractures.

SH2 description

In Salter Harris II fractures, the fracture line goes across the physis and above, breaking off a corner of the metaphysis

SH3 description

In Salter Harris III fractures, the fracture line goes across the physis and below, breaking off a corner of the epiphysis

SH4 description

In Salter Harris IV fractures, the fracture line goes through the epiphysis, physis, and metaphysis

SH5 description

In Salter Harris V fractures, the growth plate is compressed under a heavy load. The height of the growth plate is decreased but there is no discrete fracture line per se

Case:

Let's go over a case that reviews concepts from everything we've talked about so far.

History: A **5-year-old boy** is brought to the Emergency Department by his parents due to **pain** and **swelling** over his **left wrist** after a fall on the playground.

Here, we have an AP radiograph of the forearm showing the ulna and radius. If we zoom in here on distal ulna and radius, we can see that the normal contour of the distal radius should be completely smooth. However, due to a fracture, here the contour of the distal radius has a sharp bend.

This is the orthogonal view of the same forearm – notice there's a focal outward bulge in the cortex of the distal radius and ulna, the question is, is this a fracture? Indeed it is a fracture. This injury, which is unique to pediatrics, is known as a buckle fracture which is the same thing as a torus fracture, they are synonyms. Interestingly, the side of the bulge is the side on which the bone got squashed. Buckle fractures most commonly occur at what is known as the meta-diaphyseal junction, which is the junction of the metaphysis and diaphysis. An important differential diagnosis to consider in cases of a buckle fracture is a Salter-Harris II fracture. To pick up a possible Salter Harris II fracture, you would look carefully for a fracture line in the metaphysis that extends to the physis.

This concludes part 2 of this video series. In the next video in this series we will discuss fractures involving the growth plate, using the Salter Harris classification system. Before we leave, we wanted to leave you with a few key take home points

- 1) Salter-Harris fractures are important to detect clinically because they can lead to serious complications
- 2) All types of Salter-Harris fractures involve the physis
- 3) The mnemonic SALTR will help you remember the different types of Salter-Harris fractures

Thanks for watching part 2 of the pediatric MSK radiograph series on PedsCases, and please stay tuned for the rest of this series.

References:

1. Salter RB et al: Injuries involving the epiphyseal plate. J Bone Joint Surg Am. 45:587-622, 1963
2. Basener CJ et al: Growth disturbance after distal femoral growth plate fractures in children: a meta-analysis. J Orthop Trauma. 23(9):663-7, 2009

All other images are images contributed to **Radiopaedia** that are accessible online (<http://radiopaedia.org/licence>) Please enter the **rID** (radiopaedia ID) listed for any given image into the search box on the Radiopaedia home page (<http://radiopaedia.org>) to retrieve the case from which the images were obtained

