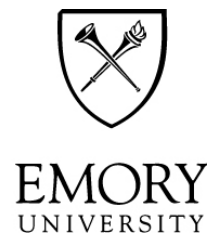


# Avascular Necrosis and von Willebrand Disease

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# J.H.: Type 2A VWD

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- 10 y/o male
  - Diagnosed with Type 2A von Willebrand Disease at 15 months old, due to tongue bleed x 24 hours from cut.
  - Hgb of 4
  - Admitted x 1 week for bleeding workup
  - Did not receive a transfusion

# Additional History

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- Past Medical History
  - Gum bleeding
  - Epistaxis with nasal cautery
  - Easy bruising
  - Hematomas with injuries
  - Recurring buttock abscess

# Surgical History

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- Circumcision at birth with prolonged bleeding
- 4 dental restorations after diagnosis
  - Received Amicar and Humate-P with no bleeding
- Nasal cautery x 2 with no bleeding issues
- 5 procedures to rectal abscess area
  - Received Amicar and/or Humate-P with no bleeding issues
- 10/2016 - (Supracore Surgery) Large Core decompression procedure of right femoral head
- 12/2016 – Removal of external fixation device hardware

# Family History

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- Mother -heavy menstrual bleeding
- Maternal Aunt and maternal cousin with menorrhagia and bleeding after surgery.
- No other family members with vWD diagnosis, but they have not been tested.

# Social History

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- Lives with mom, dad and 2 siblings
- In 5<sup>th</sup> grade
  - Had homebound schooling for 6 months due to AVN
- Played basketball and baseball prior to AVN

# Physical Exam

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- General: Well appearing, cooperative, obese, uses crutches for mobility
- Neuro: No abnormalities
- HEENT: No abnormalities
- CV/Resp: No abnormalities
- Abd: No abnormalities
- Skin: Perirectal abscess now healed/scars to fixation site
- Joints: Right hip immobile with limited weight bearing

# Bleeding Evaluation

## Cbc

- Wbc 11.5 K/mL
- Hgb 7 gm/dL
- Plts 240 K/mL

PT 15 s

aPTT 35.4 s

Fib 232 mg/dL

PFA Prolonged

TT 16.3 s

## Plat Aggs

- Low ATP release to ADP and lower limit of normal ATP release to Arachidonic acid.
- Low Ristocetin induced platelet aggregation.

## VW testing

- VWag 25 %
- RCoF <10 %
- FVIII 63%

## VWF Multimers:

Absence of high & intermediate MW multimers

**Diagnosis: Type 2A vWD**



# Disease Course and Management

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- **DDAVP non responsive**
- Bleeding Management
  - Chronic epistaxis
    - Supportive measures
    - $\epsilon$ -aminocaproic acid
    - Cautery X 2 with Humate-P
  - Dental procedures
    - $\epsilon$ -aminocaproic acid
    - Humate-P if necessary
  - Recurrent perirectal abscesses
    - I&D managed with Humate-P
  - Hemarthrosis
    - Humate-P prophylaxis

# History of AVN development

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- Attended school dance 11/2015– complained of right hip pain when mom picked him up.
- Following day – would not walk due to pain
- Local ED visit – received Humate-P 4000 vWF:RCoF units (50 vWF:RCoF units/kg)
- Transferred to CHOA Egleston and admitted
- Humate-P 4000 units q 12h

# Radiographic Evaluation

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- US right hip - large right hip effusion containing debris and possibly hemorrhage
- Continued Humate-P 4000 units q 12h
- Pelvic MRI

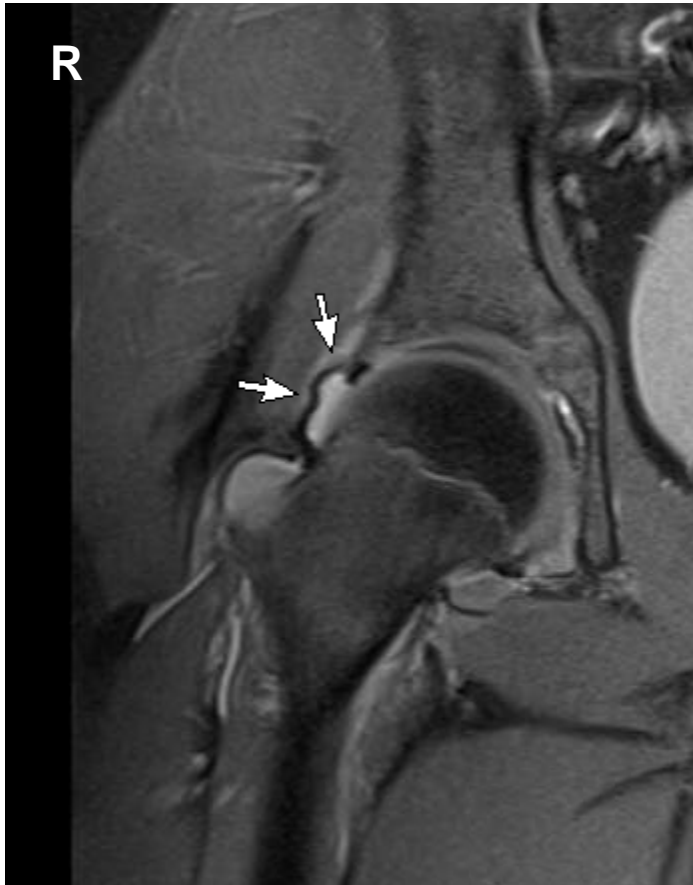
# MRI: 11/2015

## Small joint effusion and synovitis



# Small joint effusion with hemosiderin

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# IPSG MRI Score

ORIGINAL ARTICLE *Musculoskeletal*

## An MRI scale for assessment of haemophilic arthropathy from the International Prophylaxis Study Group

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 M. J. MANCO-JOHNSON,§§ S. F. MILLER,¶¶ G. E. RIVARD\*\*\* and A. S. DORIA††† ON  
 BEHALF OF THE INTERNATIONAL PROPHYLAXIS STUDY GROUP

**Table 1.** The additive IPSG MRI scale for haemophilic arthropathy. Subscores for soft tissue changes and osteochondral changes are calculated by adding points for different changes, and the total score is the sum of the subscores.

Soft tissue changes	Effusion/haemarthrosis	Small	(1)___	___
		Moderate	(2)___	
		Large	(3)___	
	Synovial hypertrophy	Small	(1)___	
		Moderate	(2)___	
		Large	(3)___	
	Haemosiderin	Small	(1)___	
		Moderate	(2)___	
		Large	(3)___	
<i>Soft tissue changes subscore</i>		<i>Maximum 9 points</i>	___	___
Osteochondral changes	Surface erosions involving subchondral cortex or joint margins	Any surface erosion	(1)___	___
		Half or more of the articular surface eroded in at least one bone	(1)___	
	Subchondral cysts	At least one subchondral cyst	(1)___	
		Subchondral cysts in at least two bones, or cystic changes involving a third or more of the articular surface in at least one bone	(1)___	
	Cartilage degradation	Any loss of joint cartilage height	(1)___	
		Loss of half or more of the total volume of joint cartilage in at least one bone	(1)___	
		Full-thickness loss of joint cartilage in at least some area in at least one bone	(1)___	
	Full-thickness loss of joint cartilage including at least one half of the joint surface in at least one bone	(1)___		
<i>Osteochondral changes subscore</i>		<i>Maximum 8 points</i>	___	___
<i>Total score</i>		<i>Maximum value 17 (9/8)</i>	___( / )	___( / )

**\*International Prophylaxis Study Group**

# IPSG MRI score

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## SOFT TISSUE CHANGES

- Small joint effusion/hemarthrosis - 1 point
- Mild synovial hypertrophy – 1 point
- Small hemosiderin – 1 point

## OSTEOCHONDRAL CHANGES

- Surface erosions – none
- Subchondral cysts – none
- Cartilage degeneration – none

**JH IPSG score MRI score 3 of 17**

# Disease Course

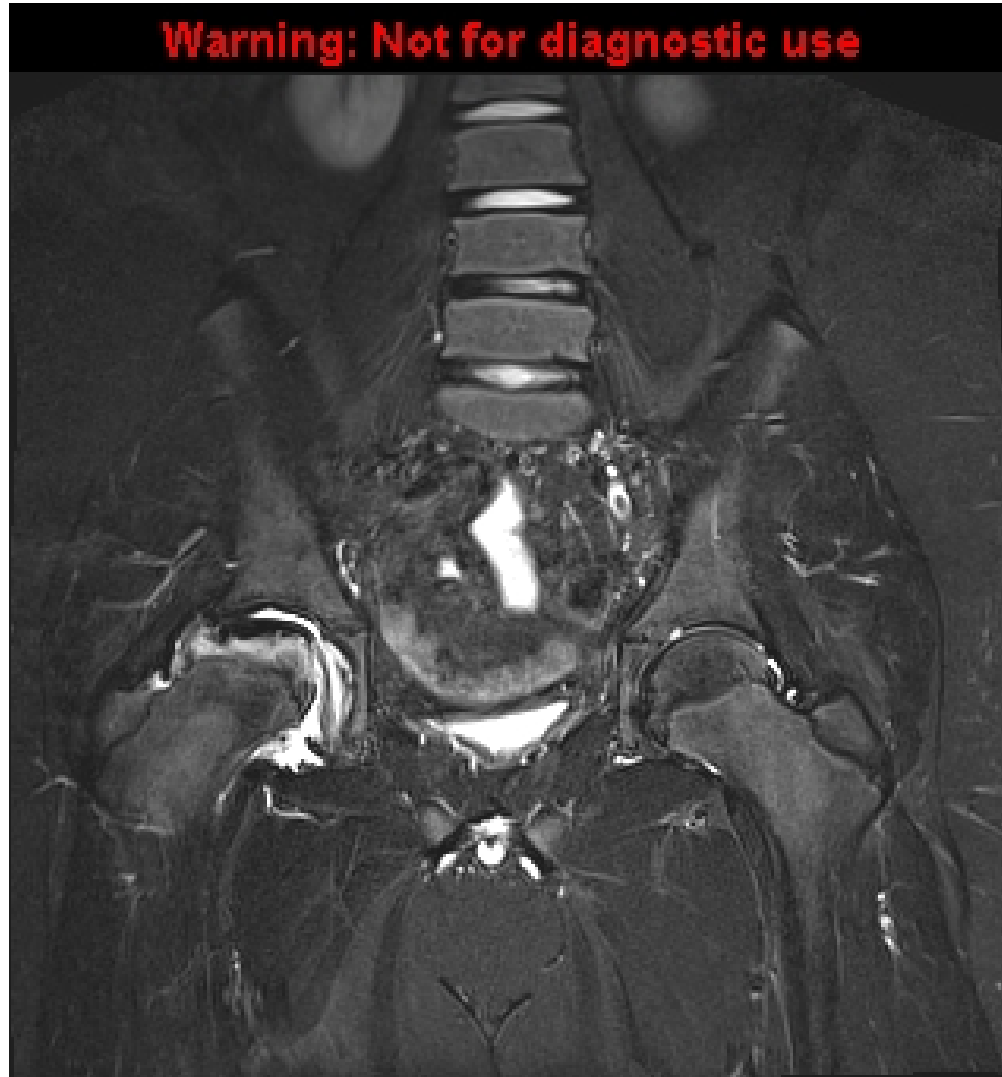
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- 12/2015-03/2016 – Intermittent prophylaxis
- 04/2016 – Increased pain– increased Humate-P to 3x/wk
  - Leg length discrepancy noted by PT (1”)
- Referred to orthopedist and hip specialist
- 5/2016 – X-ray at orthopedist shows severe AVN
  - Restricted weight bearing with improvement
- 06/2016 – follow up MRI



# Osteonecrosis

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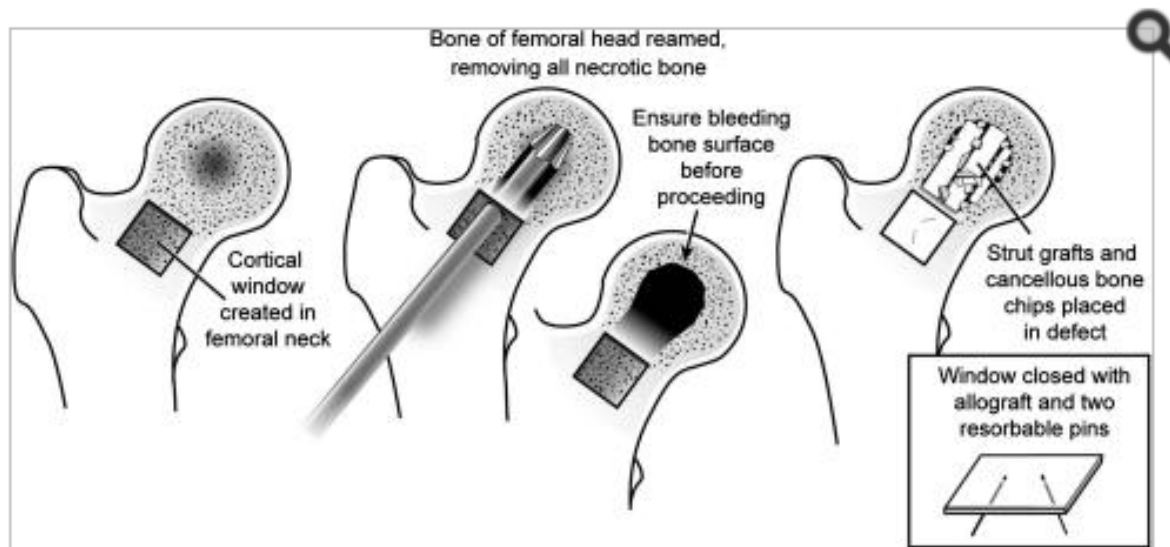
# Treatment

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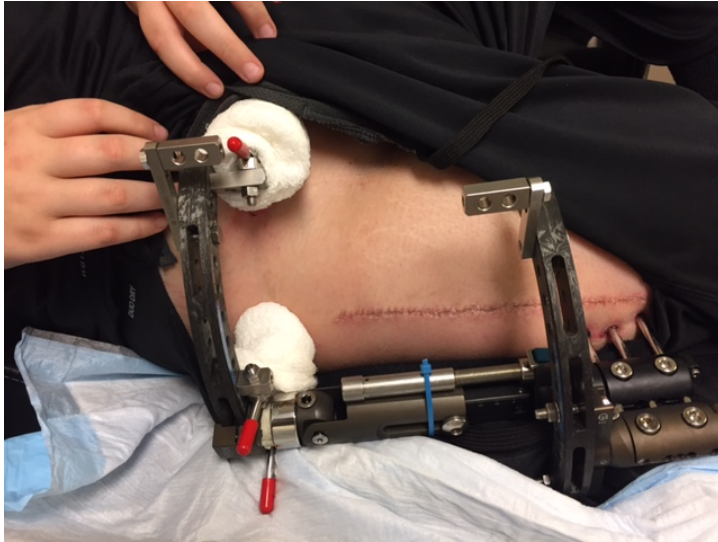
- Non-operative
  - Life Style modification
  - Pharmacologic agents
  - Physical therapy
  - Shock-wave therapy
  - Magnetic Field Therapy
  - Hyperbaric Oxygen Therapy
- Surgical Options
  - Core decompression
  - Vascularized and non-vascularized bone grafting
  - Joint replacement

# Core Decompression

- Reduces bone marrow pressure
- Stimulates new bone growth
- Replaces necrotic bone with autograft and/or allograft



# Large Core Decompression – 10/2016



# Complications

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- 1.5 weeks after surgery – returned to Georgia
  - Pain and continuous oozing from surgical sites
  - Infection, constipation and Hgb 7.4
  - Antibiotics, 2 units PRBC, bowel regimen and pain control with admission
  - Continue daily Humate-P
  - Started Amicar twice daily x 14 days

# Rod Removal – 12/2016

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# Osteonecrosis

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- Aseptic necrosis, avascular necrosis (AVN)
- Temporary or permanent loss of the blood supply to the bones
- Bone tissue dies and leads to bone collapse
- Most common at the ends (epiphysis) of long bones
- Healing process in osteonecrosis is ineffective and bone tissues break down faster than repair
- Legg-Calve-Perthes disease is non-traumatic idiopathic AVN of the head of the femur in children



# AVN/osteonecrosis

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- Progressive disorder with diminished vascular supply leading to apoptosis of cells and marrow resulting in bone collapse involving cartilage and flattening of the head surface of the bone affected.
- Can develop into osteoarthritis
- “Silent Disease”
- Often idiopathic



# Phases of AVN

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- Ischemia
  - Trauma vs. no trauma
  - Often undetermined amount of time
  - Bony epiphysis loses blood supply and pain sets in
  - X-ray not effective to find this.
- Regeneration
  - In young kids epiphyseal cartilage can synthesize new cartilage matrix
  - Subchondral bone weakens and can collapse in older patients

# Quality of Life

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- Decreased
- Degenerative Disease
- Chronic Pain
- Physical limitations
- Prolonged treatments
- Lifestyle changes

# Etiology

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- Chronic corticosteroid use
- Excess alcohol consumption
- Smoking
- End stage renal disease
- Transplant
- Gaucher Disease
- HIV
- Dysbarism
- Hematologic Disorders
  - Sickle Cell Anemia
  - Hemophilia
  - Aplastic Anemia
  - Thalassemia
  - ALL
  - Protein C and S deficiency

# VWD and Angiogenesis

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- Loss of VWF in EC results in enhanced, possibly dysfunctional angiogenesis
- VWF can regulate angiogenesis through intracellular and extracellular pathways
- Loss or imbalance between proliferation and stabilization during angiogenesis may result in excessive, unstable and dysfunctional new vessels
- Could low (or high) levels of VWF have contributed to abnormal angiogenesis and osteonecrosis

# Outcomes

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- Unknown
- Our patient is the first to have his stabilizer removed early

# Questions?

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