Extremity Sarcoma: Limb Salvage, Margins, and Function

St. Jude Children's Research Hospital

ALSAC • Danny Thomas, Founder



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FREE PARKING
IN REAR
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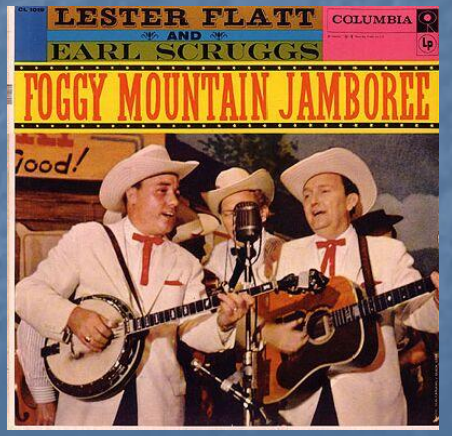
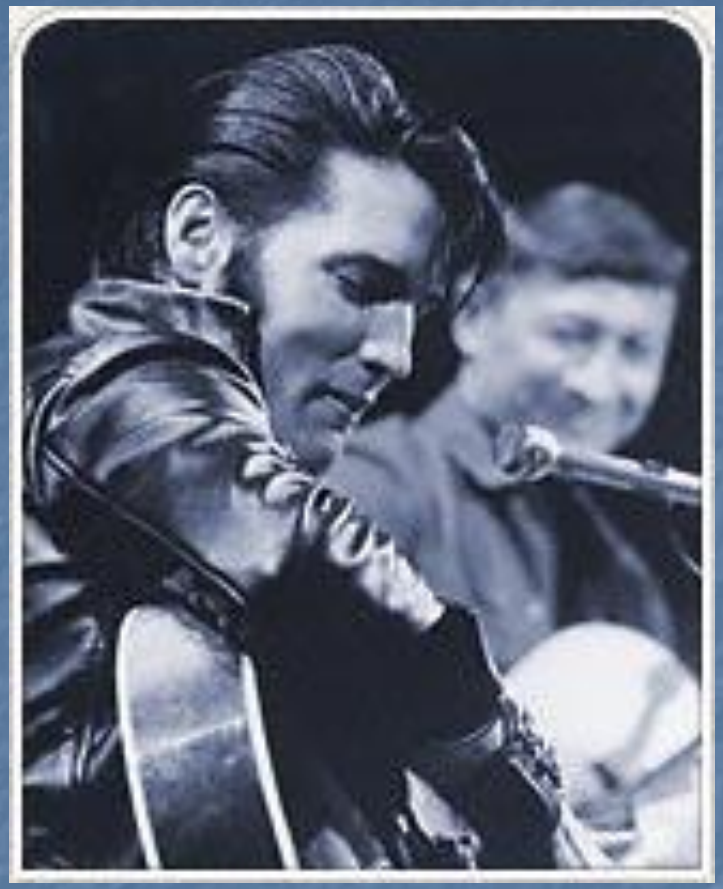

LESTER FLATT
AND
EARL SCRUGGS
COLUMBIA
FOGGY MOUNTAIN JAMBOREE



Memphis



Nashville

Disclosures

- I have nothing to disclose pertaining to this presentation

Overview

- Discuss indications for LSS
- Review importance of margins
  - How they relate to survival and local control
  - How they affect function
- Function
  - Regarding indications
  - What surgical factors influence function


NO E.R.
E.R. ENTRANCE

Limb Salvage Surgery for STS

Keys to Success

"LSS Team"

- Medical Oncologist
- Surgical Oncologist
- Orthopaedic Oncologist
- MSK Radiologist
- Radiation Oncologist
- MSK Pathologist
- Surgical subspecialties
  - Plastics, Vascular,
  - Orthopaedic subspecialties (hand, total joint etc)

Initial evaluation and staging of a soft tissue mass

- Consultation with appropriate team members
- Imaging
  - Plain films
  - MRI (with and without contrast)
  - Chest CT
  - PET
- Biopsy
  - Needle Vs open

Staging

- Once the initial workup is completed the patient is "staged"
- The "Stage" is a combination of
  - Tissue type
  - Histological grade (High Vs Low)
  - Tumor size
  - Location
  - Lymph node surveillence
  - Pulmonary disease

Biopsy

- Done AFTER imaging completed
- May identify a more "worthy" target
  - Another lesion
  - Pulmonary lesion
  - Lymph node

Biopsy

- Most important step in staging
- The biopsy track must be resected with the tumor as it contains tumor cells
- The biopsy must be placed appropriately
- An ill placed biopsy can result in the inability to perform LSS

Staging

- Staging can influence the surgical approach based on presence/absence of nodal or pulmonary disease
- Important to complete staging prior to final decisions on LSS

Biopsy

- Must be performed by an experience clinician (IR, MSK radiologist, Surgeon)
- Needle preferred or open
- Review case and images with an experienced MSK pathologist



Low Grade Vs High Grade

- Important to get a definitive diagnosis of Grade
- The pathologist must be experienced
- From a surgeons perspective it is either Low grade or high grade
- “Intermediate” grade requires a discussion with the Pathologist

Low Grade Vs High Grade

- Low grade = low risk of metastatic spread
- High Grade = high risk of metastatic spread
- Treatment is markedly different
  - Surgical management / Margins
  - Low grade receive NO neoadjuvant treatment
  - High Grade receive RT and +/- Chemo

After Definitive Diagnosis of STS

- Discuss role of Neo-adjuvant therapies with team
  - Chemotherapy, Immunotherapy, Radiation
  - Timing (pre or post op)
- This will influence timing of surgery
- 3-6 Months of neoadjuvant treatment before local control can occur

Primary indication for LSL S

- Can adequate oncologic margins be achieved ?
  - R0 is desired but may be less so to preserve "vital structures" where a marginal or R1 may result
- Secondary indication
  - The function must be better or equal to an amputation

Margins

- Defined as the distance from tumor to cut resection edge
  - R0- no tumor in wound bed, or at edge of specimen
  - R1- no gross tumor , but tumor extends to edge of cut specimen
  - R2- macroscopic (visible) tumor in wound bed

Importance of Margins

- Margins directly impact ability to achieve local control
- Patients with positive margins have double the rate of local recurrence
- How local recurrence affects long term survival is debatable but does not seem to be a significant negative predictor

Impact of resection margin on outcomes in high-grade soft tissue sarcomas of the extremity—A USSC analysis

Konstantinos Chouliaras MD, Nathan Patel MD, Rebecca Senehi MD, Cecilia G. Ethun MD, MS, George Poultsides MD, Valerie Grignol MD, Thomas Clark Gamblin MD, Kevin K. Roggin MD, Ryan C. Fields MD, Ralph D'Agostino Jr PhD, Edward A. Levine MD, Kenneth Cardona MD, Konstantinos Votanopoulos MD ... See fewer authors

- In high-grade extremity sarcomas, tumor size and gender are predictive of OS while R0 resection status is associated with improved locoregional recurrence rate without a significant impact on distant RFS or OS.

Margins

- Low Grade tumors only require a "marginal" R1 type margins. So a "shell out" is acceptable in most cases
- High Grade tumors require a wide margin R0 with tumor free margins

Patient considerations for LSS

- Important to consult with the patient and family to outline surgical options
- All team members need to contribute to the conversation
- Each to describe how their aspect of treatment will affect function (for better or worse)

Patient considerations

- Patient needs to understand that LSS is a complex surgical procedure with inherent risks and long term recovery
- Function will never be “normal” but can be quite functional

LSS Considerations

- Assemble a team of appropriate specialists
- Need a "quarterback" to lead the team
  - Patient and families need a contact person
  - Organizing consults
  - Scheduling surgery
  - Facilitate flow of information among the team

Team Considerations

- A regular multidisciplinary type conference with all available (live or remote) is crucial to achieving success
  - This allows image and pathology review
  - Discussion of neo-adjuvant treatments and updates
  - Surgical planning among the surgeons

Resection and Reconstruction

- Different subspecialties contribute in different ways
  - General surgery/Orthopaedic oncology perform surgical approach and resection
  - Vascular surgery if there is vessel involvement for repair / grafting
  - Plastics for local or free flaps to reconstruct deficits and wound closure

Resection

- After removal of the specimen it is imperative to review the specimen with the MSK pathologist in person if possible
- Orientation of the tumor assists with tumor bed re-resection for positive margins (R1) that may occur
- And to point out any potential close margins or areas of concern

Reconstruction

- To achieve the desired R0 margin a 1cm margin is attempted during the resection
  - Often this is much less around vital structures such as nerve and artery
- This can result in significant muscle loss, loss of tendon attachments, joint exposure etc.
  - Orthopaedic implants may required for bone involvement
  - Low grade tumors rarely require complex reconstructions

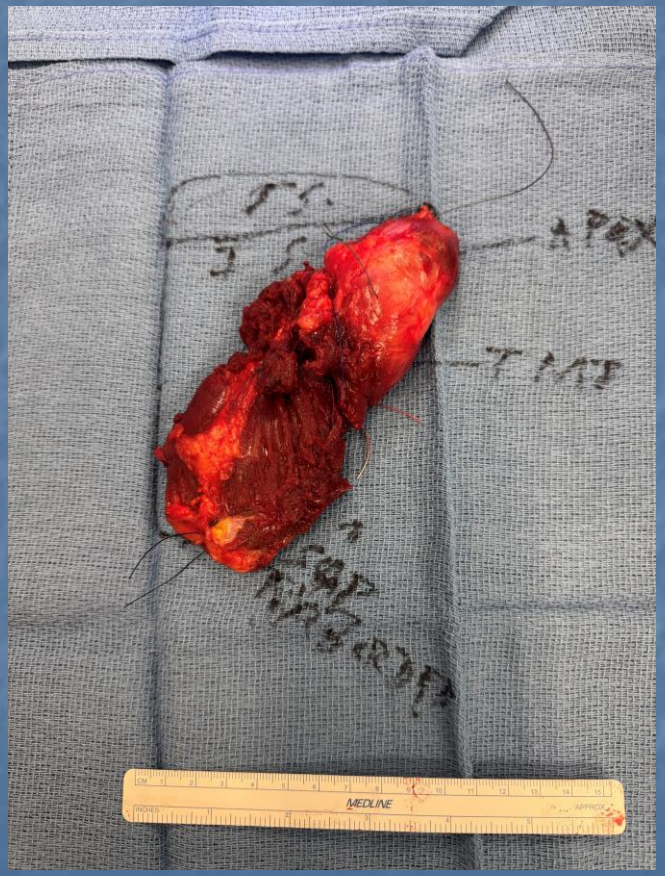
Reconstruction

- For significant defects, rotational flaps or free flaps are utilized to provide a functional extremity or fill a dead space
- Grafts or flaps may be required for wound closure

Function – Important Considerations

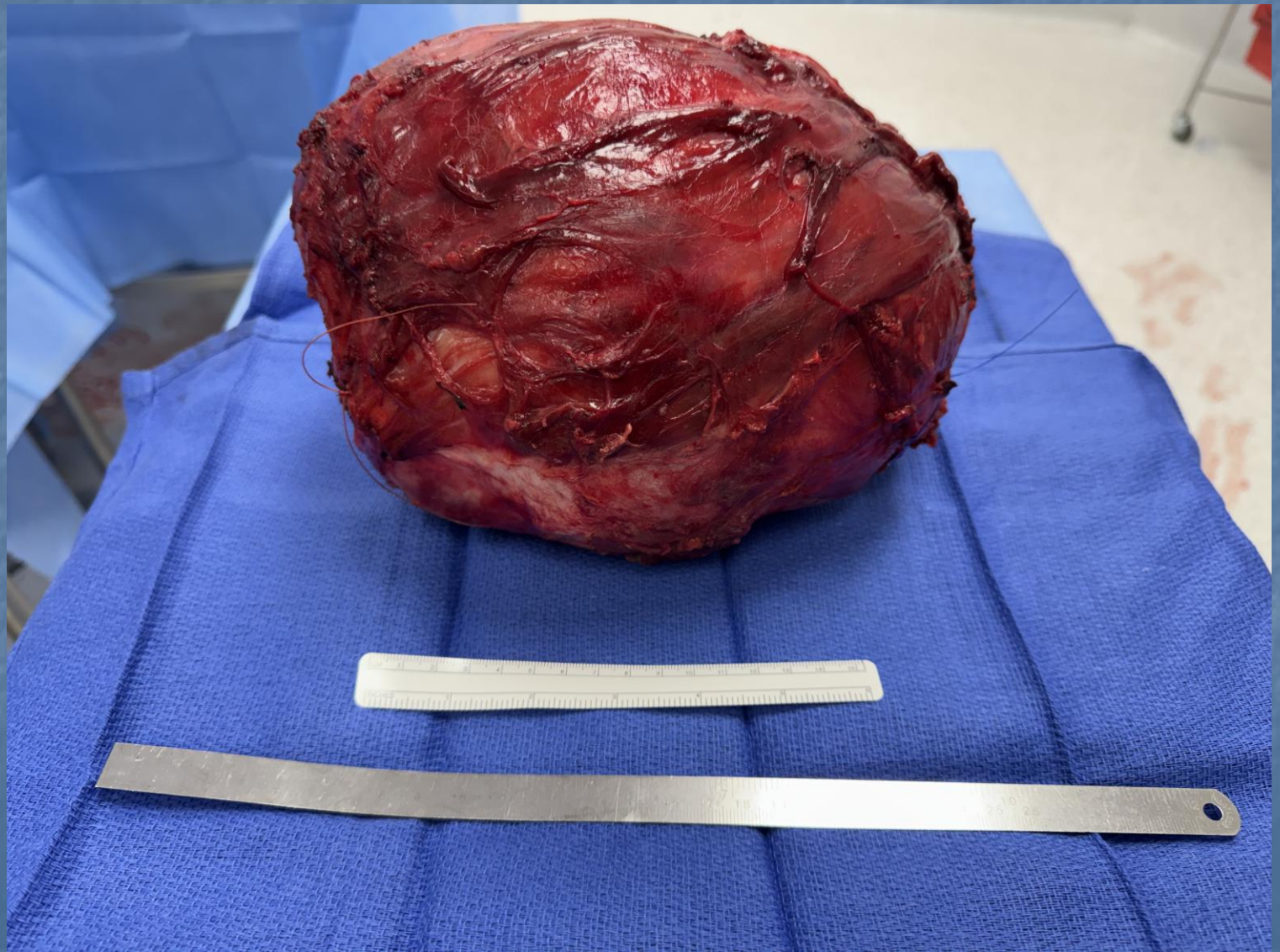
- What needs to be removed for surgical margin ?
- What was removed to achieve this ?
- How was this reconstructed ?
- Anticipated deficits from muscle loss, reconstructions, nerve deficits

Function



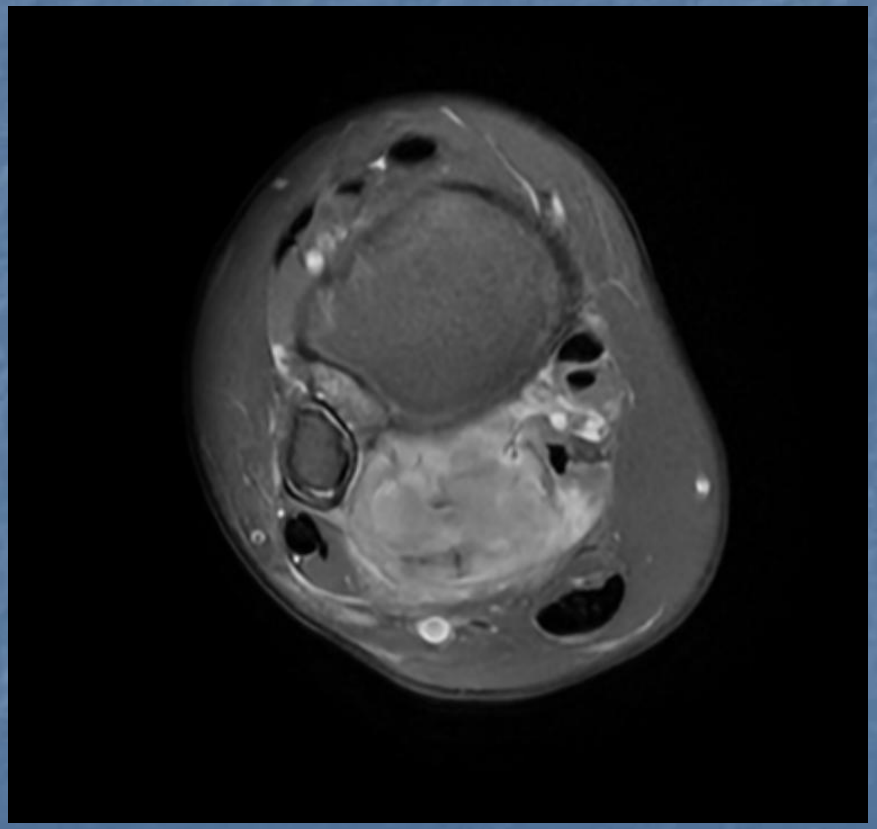
- Size and location affects functional outcomes
- There are tumors…

And there are tumors…



Function

- LSS MUST be better functionally than an amputation
- Most STS resections at the foot and ankle are better served with a Below Knee Amputation



Function – Post op Rehabilitation

- A dedicated team of Physical Therapists and Occupational therapists is vital to getting the best functional outcomes
- Pre operative evaluation helpful if possible
- Setting expectations and goals helps achieve success

Rehab

- Definitive plan determined based on resection and reconstruction
- Involves multiple factors
  - Amount of muscle resected, soft tissue reconstructions like tendon repair, bone and joint involvement all play into post op rehab

Rehab Considerations

- Early mobility is important
- Ongoing regular rehab visits
- Ongoing education
- Define / adjust goals

Rehab Considerations

- When can range of motion start ?
- When can weight bearing be initiated ?
  - Often both are delayed to allow for soft tissue reconstructions to heal

Case Examples

STS with Bone involvement


HP
FA
Brown David


H
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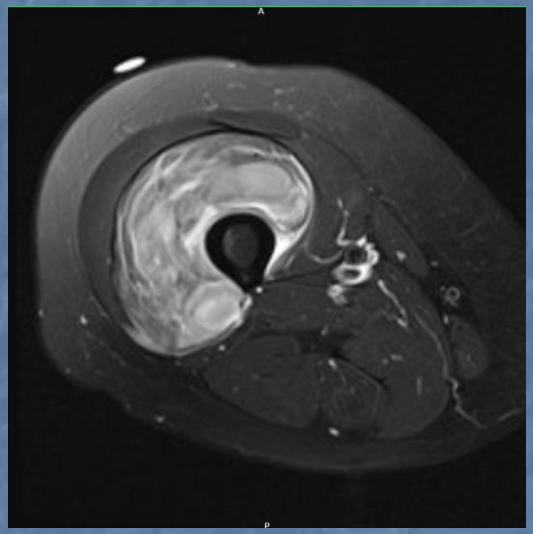
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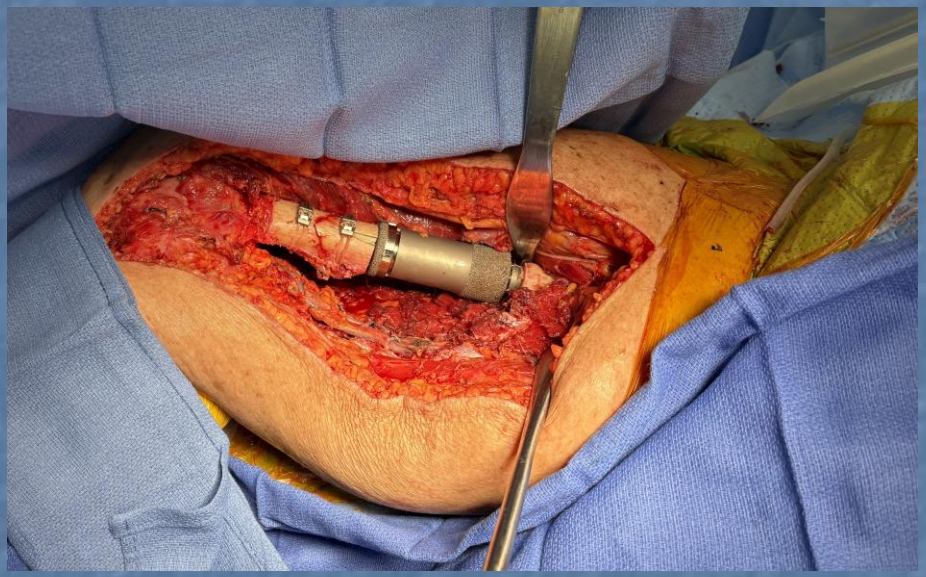


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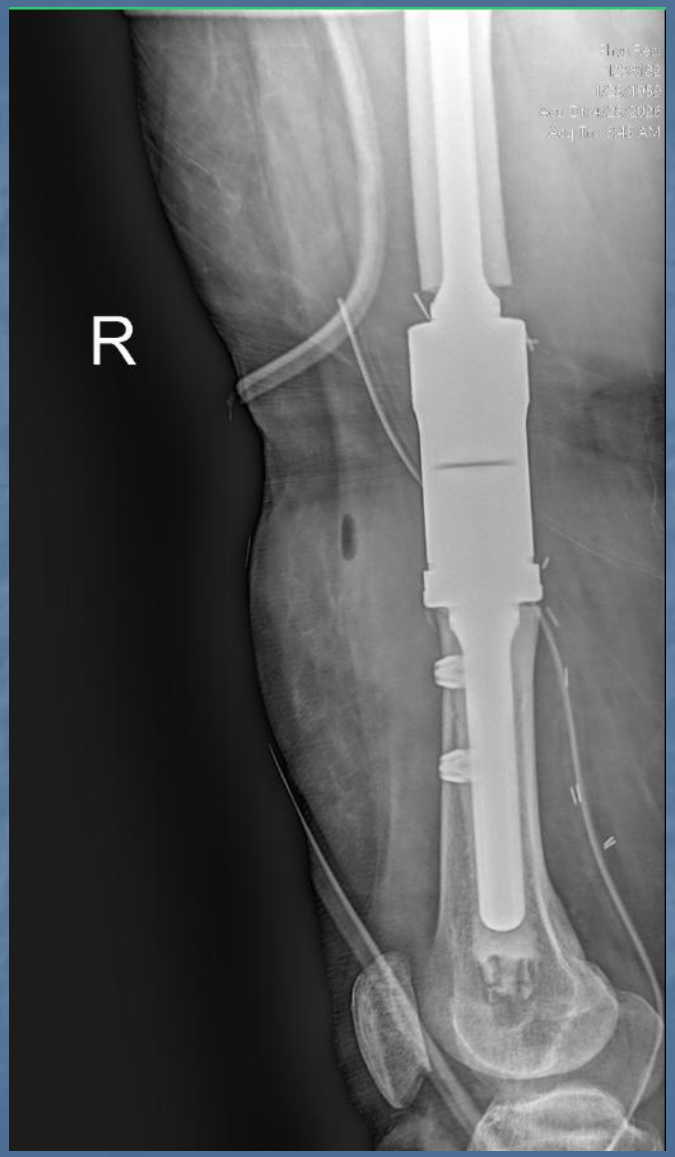
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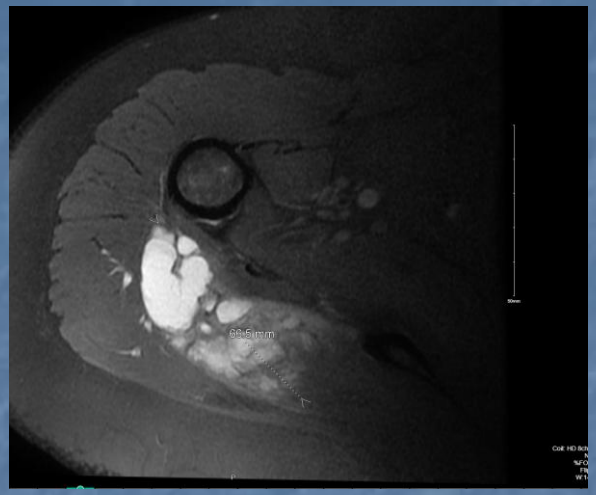
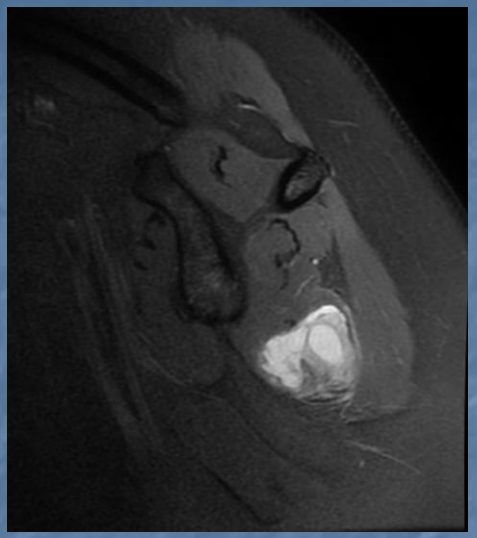
STS of Teres Minor

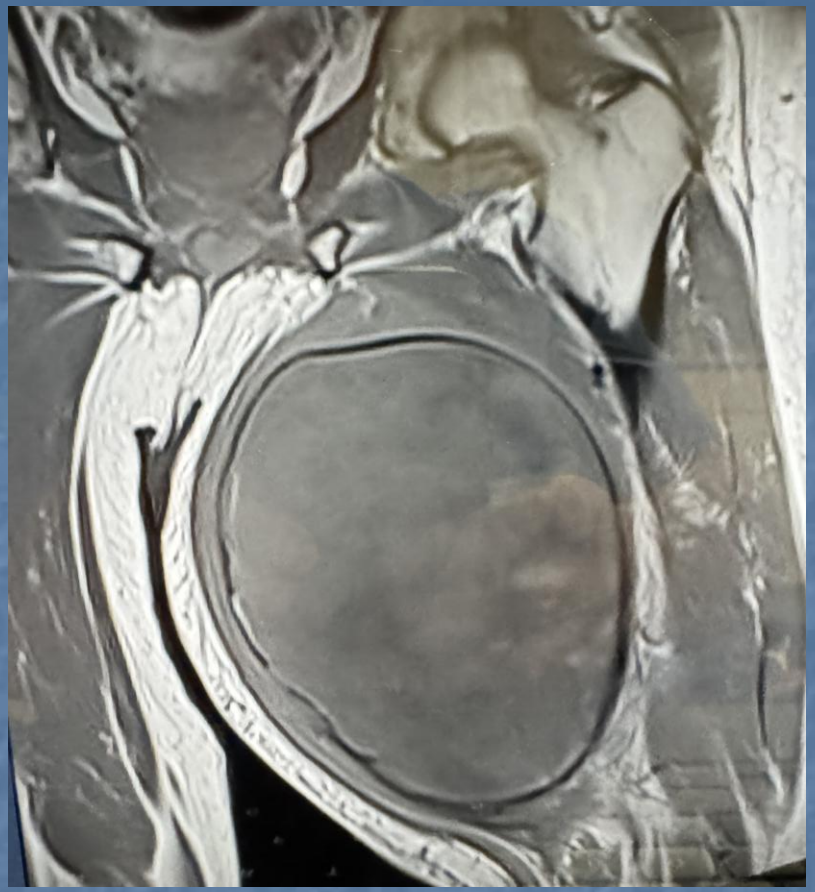


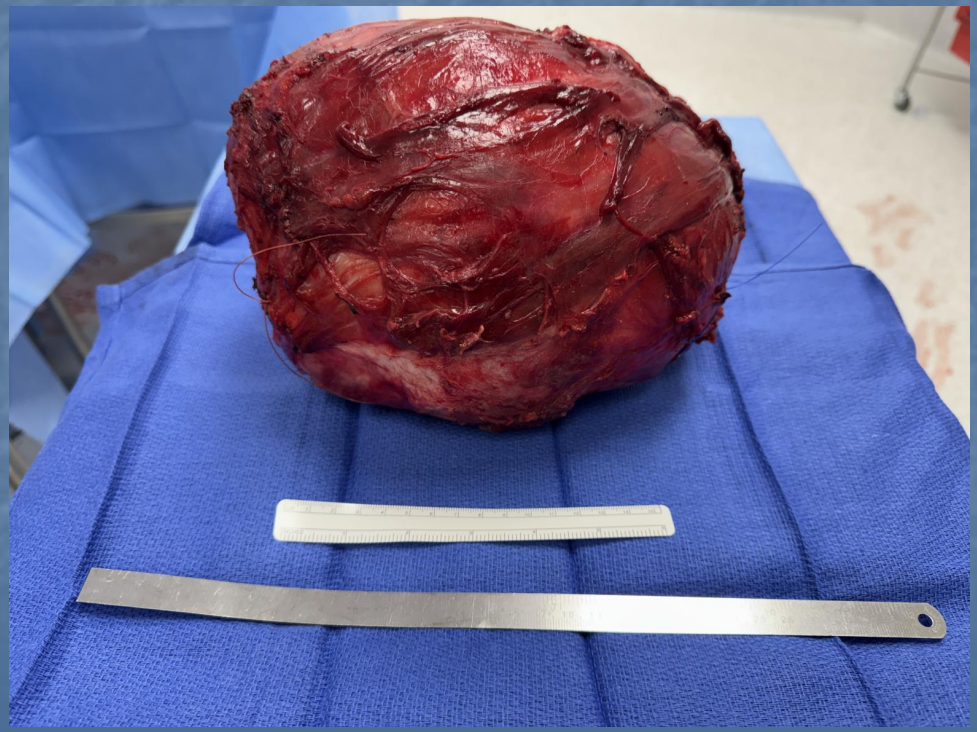



APEX
MEDLINE

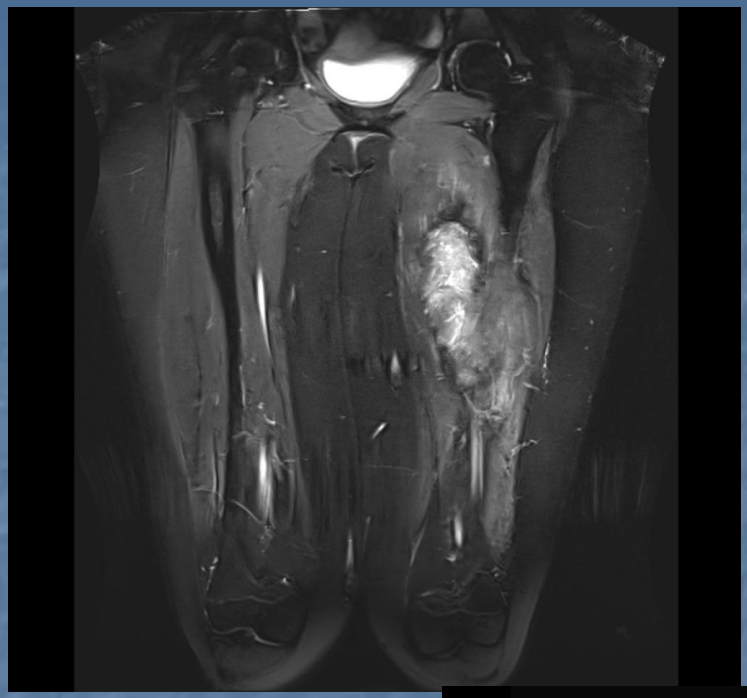

APEX
MEDLINE

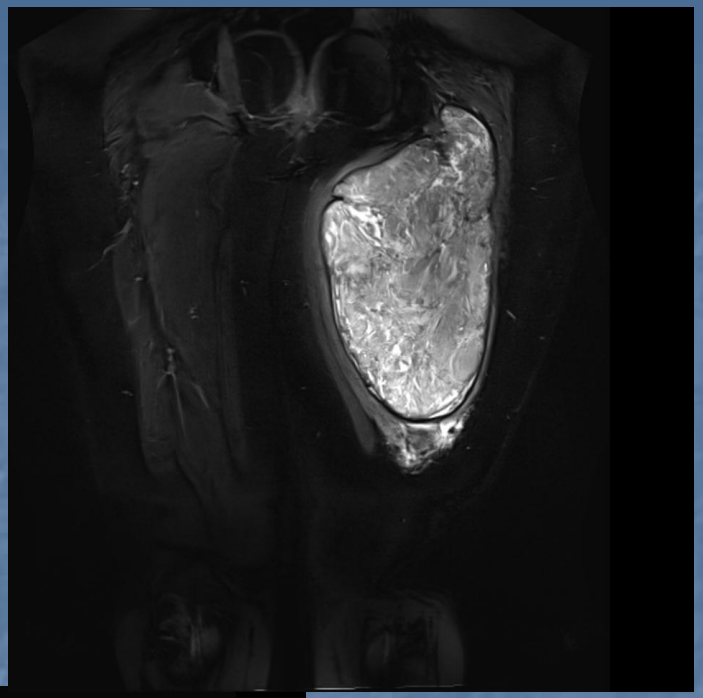
Medial Thigh Mass

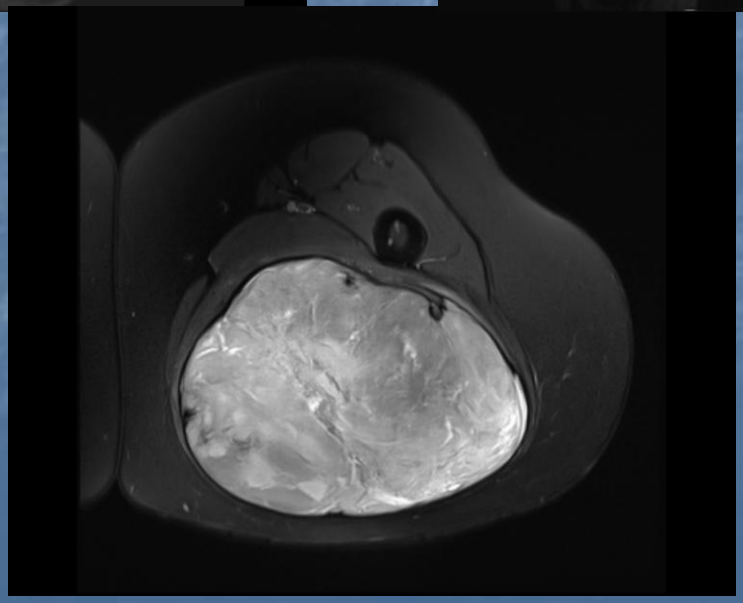




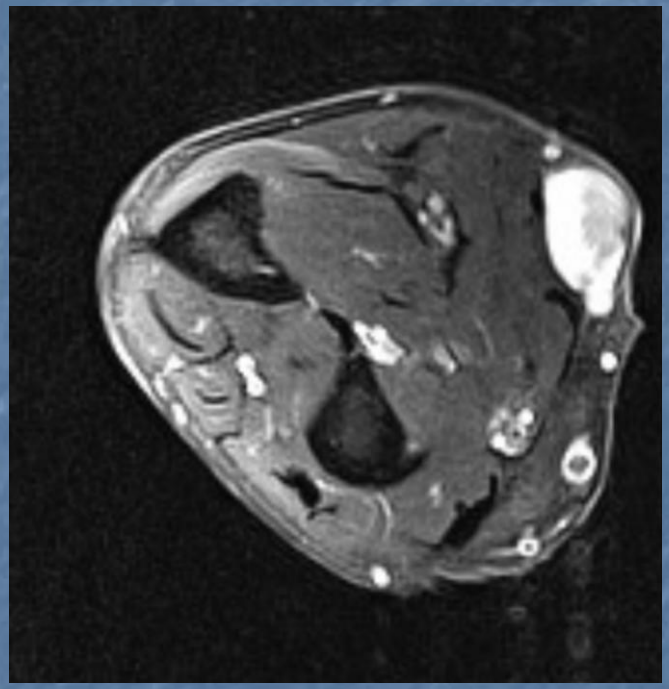
Posterior Thigh Mass







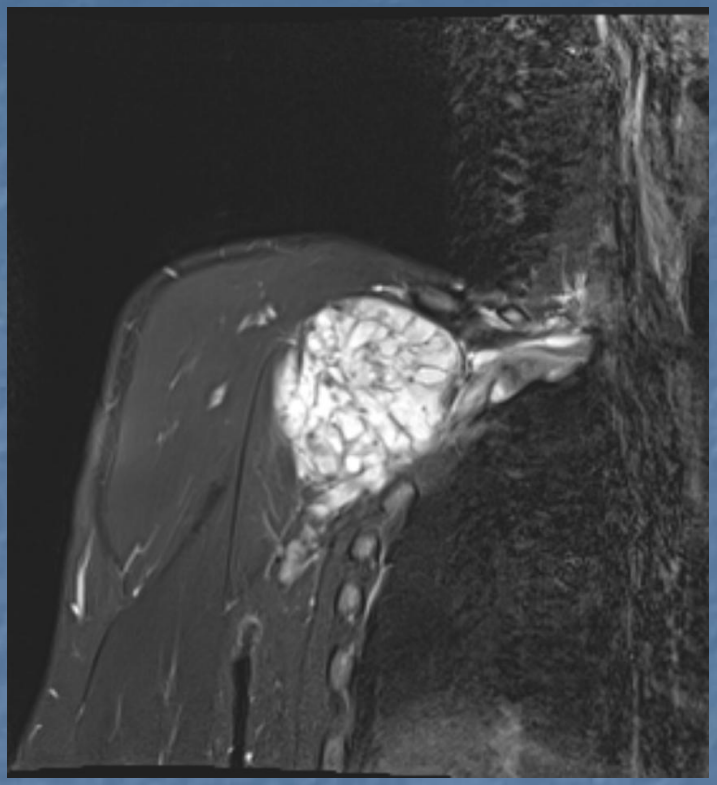
Forearm STS



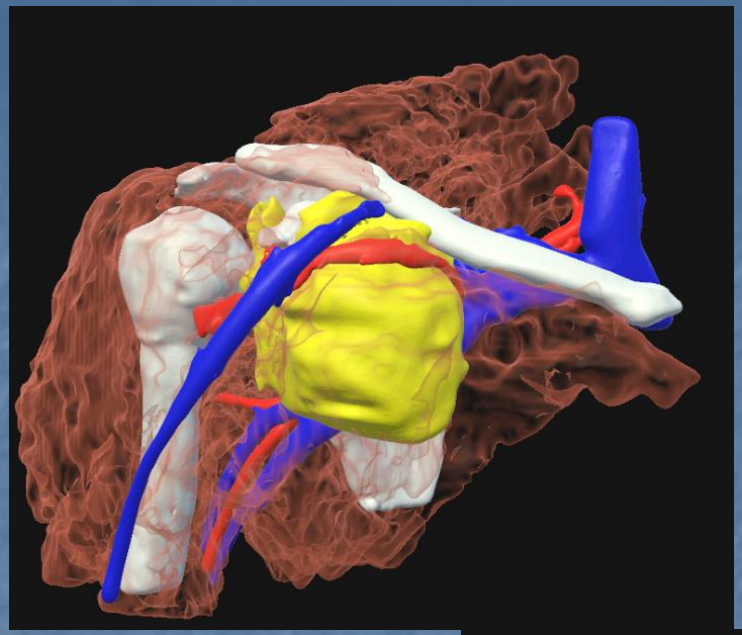


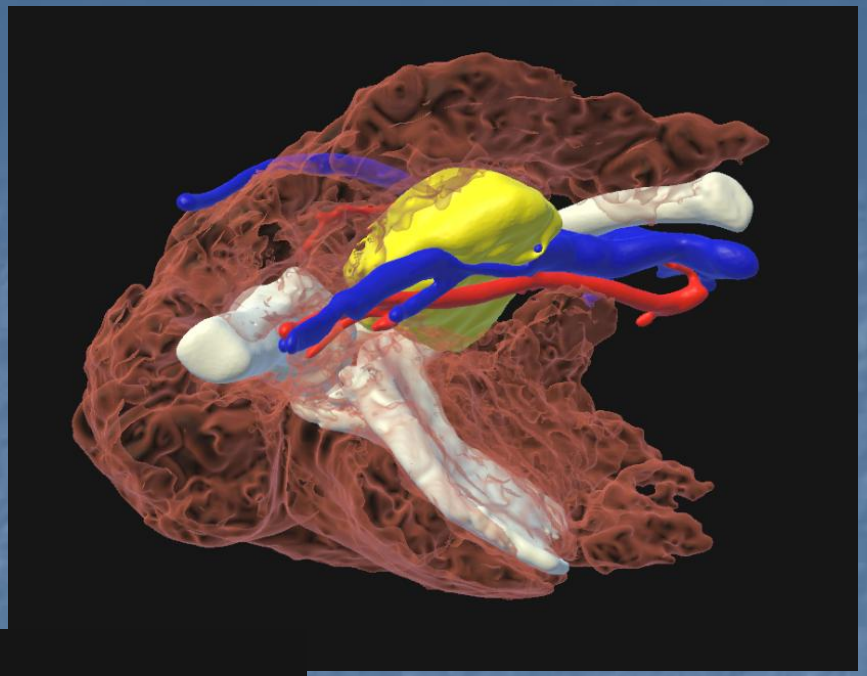


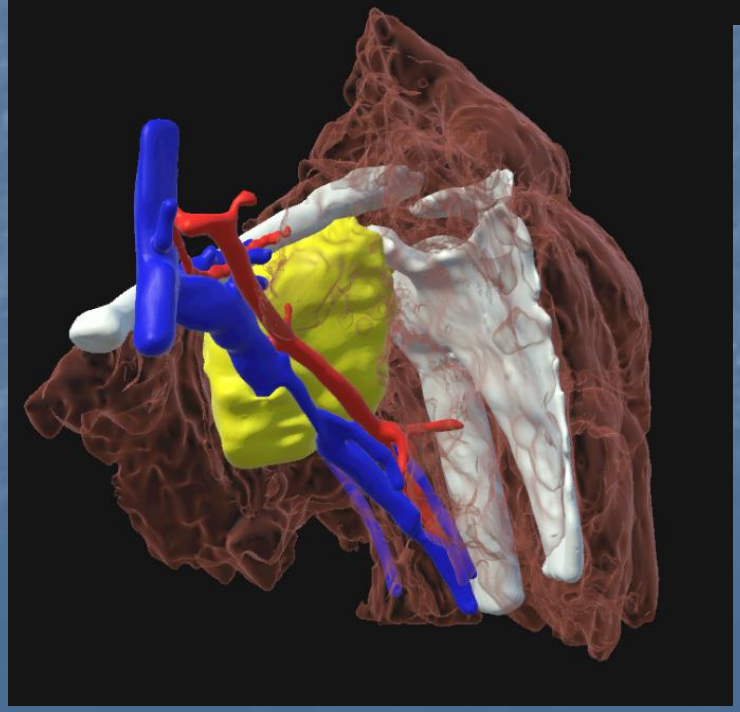
Low Grade STS Shoulder

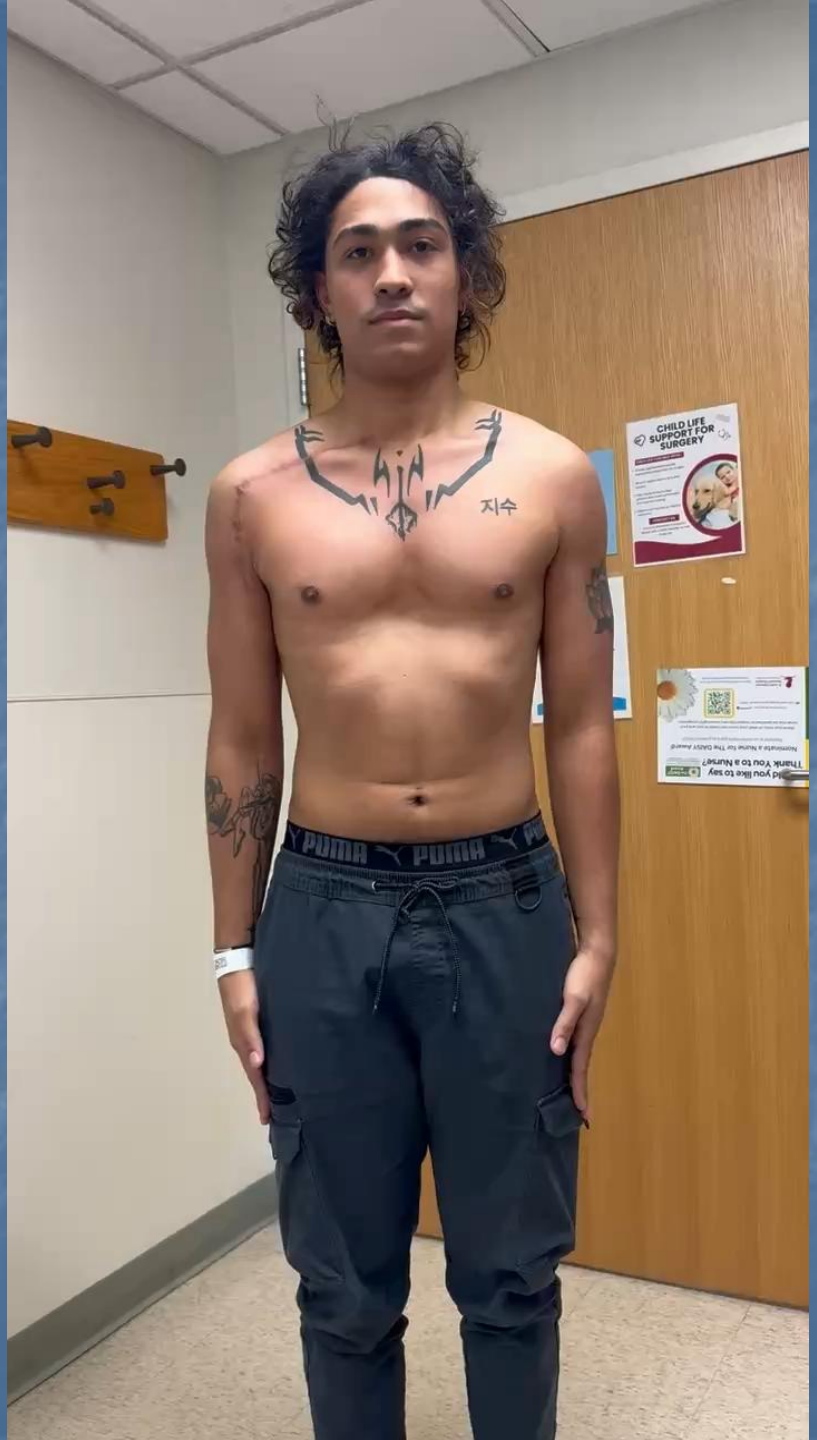











CHILD LIFE SUPPORT FOR SURGERY
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Summary

- LSS provides a functional result in carefully selected patients and managed by the appropriate multidisciplinary team
- Margins are an important consideration for LSS
- Margins can affect function due to tumor resection required
- Function is a result of tumor resection and post op rehab

Thank ya, Thank ya, very much

