A Multidisciplinary Approach to Limb Preservation
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Institute for Limb Preservation (ILP) is a team of medical professionals specializing in management of complex extremity problems and treatment of conditions and diseases that place people at risk of losing an extremity and potentially their life.

To foster a patient-centered, team-based, innovative approach to the diagnosis and treatment of complex limb and life-threatening conditions.

ILP – Who Are We?

Mission Statement
Founding principles of Drs. Ross Wilkins, Tom Arganese and Bill Brown since 1986:
- Patient Centered Care
- Seamless teamwork amongst specialists to improve patient outcomes
- Provide “uncommonly good care”

Based at Presbyterian/St Luke’s Medical Center in Denver Colorado
Community based tertiary care program with both hospital employed and private practice physicians

Our multidisciplinary team
- Weekly interdisciplinary patient conference
- Sub-specialty expertise including oncology, adult and pediatric orthopedics, microvascular surgery, infectious disease, amputations and physical medicine and rehabilitation
- The latest treatments with proven success based on the on-going ILP clinical research
- Active involvement in outcome studies, publications, and presentations at world-wide medical conferences
What We Do – ILP Service Lines

- Tumors – Sarcoma and limb threatening carcinoma
- AVN/Osteonecrosis
- Non-Union/Bone Healing
- Amputations
- Replant (mangled extremities)
- Complex Joint Reconstruction
- Extremity and joint infections
- Research

What We Don’t Do

- Diabetic ulcers/ infections – some exceptions in young active patients
- Paraplegic/ quadriplegic pressure related ulcers
- Necrotizing fasciitis – some exceptions to this as well

Diabetic Exception

- 55 year-old male financial planner
- Active
- Had not seen a doctor for 10 years – last visit he was told he was overweight and borderline diabetic
- Started exercising and lost 50 lbs
- Presented to an outside orthopedic surgeon with 7 day history of worsening foot infection
- BS 450
**Diabetic Exception**

- Debrided 2 times at outside hospital and transferred to ILP
- Debrided one more time then underwent latissimus dorsi free flap with STSG (latissimus muscle taken from back and transferred to foot, thoracodorsal vessels anastomosed to the posterior tibial vessels, skin graft taken from thigh)

**Tumor Service Line**

- Sarcoma makes up the bulk of limb threatening tumors
  - Bone origin (eg osteosarcoma and Ewings Sarcoma)
  - Soft tissue origin (eg liposarcoma, synovial sarcoma, myxofibrosarcoma, pleomorphic sarcoma)
- Limb threatening carcinoma less common

**Tumor Service Line**

- 2 orthopedic oncologists
- 3 plastic surgeons that do reconstruction as well as hand tumors
- 1 oncologist that specializes in sarcoma
- MS radiologists and interventional radiologist
- 2 radiation oncologist
Tumor Service Line – Case

• 36 year-old male
• Lives not too far from here
• Mass growing in his left thigh for about 6 months
• Thought it was a result of trauma
• Finally sought medical care and had it biopsied

Tumor Service Line – Case

• Malignant triton tumor - relatively rare, aggressive tumor made up of both malignant schwannoma cells and malignant rhabdomyoblasts. Classified as a malignant peripheral nerve sheath tumor with rhabdomyosarcomatous differentiation

Tumor Service Line – Case

• Had preop radiation
• Underwent resection with orthopedics
• Reconstruction with plastics utilizing an anteriolateral thigh flap
• Donor site skin grafted
Specialties Involved

- Orthopedics
- Plastics
- Oncology
- Radiation oncology
- Radiology
- PT/OT
- Pathology

AVN / Osteonecrosis

- A condition in which poor blood supply to an area of bone leads to bone death
- Most common locations for avascular necrosis and osteonecrosis
  - Femoral head
  - Talus
  - Scaphoid and lunate

AVN Case

- 25 year-old male
- Presented with right scaphoid non-union
- CT scan showed signs of AVN of the proximal pole
AVN Case

• Taken to OR
• Vascularized bone flap taken from volar distal radius
• Humpback deformity corrected
• Screw placed
• Healed and entire bone looks vascular

Specialties Involved

• Plastics/ Hand
• Radiology
• Hand Therapy/ PT
Nonunion / Bone Healing

- Commonly seen in tibia
- Less common in femur and upper extremity
- Often after open fractures
- Commonly associated with infection but can be associated with many conditions
- Bone loss after trauma

Nonunion / Bone Healing – Case

- 65 year-old female
- Suffered femur fracture in car accident 2 years earlier
- Femur was rodded
- Went on to nonunion

Nonunion / Bone Healing – Case

- Rod removed and bone cut back to good bleeding bone
- 2 plates placed at 90 degrees to each other
- Vascularized fibula bone transferred from same leg and peroneal vessels anastomosed to the femoral vessels
• Orthopedics
• Plastics
• Radiology
• PT/OT
• Pathology

Amputations are a very important part of limb preservation
• We do not consider it a “failure” of limb preservation
• We use many techniques to preserve both length and function

• 32 year-old male lost both legs in MVA
• Right side above knee and left side through the knee
• Transferred to ILP in the subacute period
• Underwent transfer of rectus abdominus muscle to left leg to preserve length
Amputation – Case

- Had significant problems with the right above knee amputation
- Multiple revisions
- Finally underwent osseous integration
- Significantly improved prosthetic wear

Specialties Involved

- Orthopedics
- Plastics
- Radiology
- PT/OT
- PM and R

Replant/ Mangled Extremity

- 24/7 call
- Treat both upper extremity amputations and upper extremity mangling injuries
- Hand/plastic/microvascular surgeons
- Orthopedic surgeons
- Adult and pediatric
Replant/ Mangled Extremity

- 35 year-old cowboy/ rancher
- Team roping competition
- Roped his thumb off
- Transferred from Nebraska to the Institute for Limb Preservation

Replant/ Mangled Extremity

- Taken to the OR emergently
- Thumb replanted
- Doing very well and back to team roping

Complex Joint Reconstruction

- 1 million total joints performed in the US each year (4 million in 10 years)
- Can have any number of issues or complications
  - Infection, aseptic loosening, pain, metal allergy, periprosthetic fracture
- Specialize in treating these difficult to treat problems
Complex Joint Reconstruction

• 79 year-old female
• Total knee arthroplasty in Florida
• Fell in the post operative period and had drainage
• Unable to straighten knee
• Moved to Colorado
• Knee infected and extensor disrupted

Complex Joint Reconstruction

• Taken to the operating room for explant of joint and gastrocnemius flap
• Allowed to heal and 6 weeks of antibiotics
• At 3 months return to OR for replant of knee with hinged prosthesis and repair of extensor mechanism

Specialties Involved

• Orthopedics
• Plastics
• Radiology
• PT/OT
• Pathology
• Infectious Disease
Extremity / Joint Infection

- Infection is a major problem that can threaten an extremity
- Native tissue (soft tissue or osteomyelitis)
- Associated with hardware (fracture treatment or total joint replacement)
- “Cancer like” approach to infection
  - Ability to reconstruct allows this

34 year-old male
- Tibia fracture
- Underwent ORIF with subsequent infection
- Presented to ILP
- Hardware removed and bone debrided
- Had rectus free flap, skin graft
- Bone transport done – eventually healed

Specialties Involved

- Orthopedics
- Plastics
- Radiology
- PT/OT
- Pathology
- Infectious Disease
Research

• Research is an essential part of our program
• Full time research assistant
• Forefront of evidence based medicine

ILP Success

• Developing a world-class sarcoma and extremity salvage program in a community based location with “academic” values
• Advantages
  – Excellent collaboration between physicians
  – Ease of access for patients
  – Able to work with physicians closer to patient’s home
  – More “nimble” than an academic program
  – Limb Preservation Foundation

ILP Challenges

• Mix of hospital employed practices and private practices can be a challenge (hospital can not directly advertise for non-employed physicians)
• Do not have the marketing budget of a large academic institution – have to make up with good personal relationships with referring physicians
Limb Preservation Foundation

• The foundation was started by Dr Ross Wilkins in 1986 to support:
  – research to advance the science of limb preservation
  – help our patients through the economic stress of living through a limb threatening illness
• Strong relationship between ILP and the foundation.