Amputee Rehabilitation: The early post-op phase

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Disclosures

- This presentation contain slides adapted from Drs. H Acharya and J. Hebert
Canadian Statistics

- ~1300 LE amputations are performed each year in Canada for ischemia/malignancy
- 10% of these amputation are performed in Alberta
- 88% are performed by Orthopedic Surgeons
- 65% are below knee amputations
- 96% of patients with LE amputations have diabetes
- 9% mortality rate in the same admission

Alberta statistics
- BKA from any cause: 280/year (~130/year in Edmonton)

Goals of Amputee Rehab

- Adapt to life without a leg
  - Education
  - Psychosocial support
- Functional Independence
  - Independence with activities of daily living
  - Restore safe functional mobility - wheelchair, gait aids or prosthesis
  - Arrange appropriate equipment
- Prevent secondary complications
- Return to community and leisure activities
Phases of Amputee Rehab

1. Pre-amputation
2. Surgery
3. Post-amputation (early post op)
4. Prosthetic fitting
5. Pre-prosthetic
6. Long term
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**Pre-amputation**
- Risk factor modification
- Surgical level
- Functional outcomes
- Minimize trauma to tissues
- Optimize strength/range of motion

**Early post-op**
- Wound management
- Edema management
- Post amputation pain
- DVT prophylaxis
- Early mobilization

**Pre-prosthetic**
- Independence with ADLs
- Mobilization and pre-prosthetic training
- Limb shaping and protection
- Equipment
- Psychosocial support

**Prosthetic fitting**
- Independence with prosthesis
- Maximize function
- Resume community/leisure activities
Wound Management
Factors affecting wound healing

- General Factors
  - Nutritional state
  - Electrolyte and fluid balance
  - Anemia
  - Renal disease
  - Diabetes / high blood glucose
  - Smoking

- Local Factors
  - Edema
  - Mechanical stress
  - Hematoma
  - Infection
  - Trauma
  - Necrosis
Edema: why do we care?

- Edema increases rapidly during the early post-op phase
- Complications associated with edema:
  - Pain
  - Delayed wound healing
  - Delayed time to ambulation/prosthetic fitting
  - Increased length of hospital stay
  - Inadequate residual limb shaping
Limb Shaping
Edema Management

**Prevention**
- Accurate hemostasis
- Gentle handling of soft tissue
- Minimize internal tissue disruption
- Manage medical complications
- Avoid fluid overload

**Treatment**
- Elevate the limb
- External pressure/compression
- Treat medical complications
Edema Management

Prevention
- Accurate hemostasis
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Treatment
- Elevate the limbs
- External pressure/compression
- Treat medical complications
What is the best option for compression?

- Reduces or prevents edema
- Easy to apply
- Allows for frequent wound checks
- Cost effective
- Minimal staff involvement and can be donned/doffed by patient
- Does not cause complications
  - Dehiscence, local ischemia, distal choking or venous congestion, maceration/moisture build up
Compression Options

Elastic
- Elastic Wrapping
- Tubular Compression
- Compression socks

Semi-rigid
- Polyethylene (pelite foam)
- Gel liners (silicone)

Rigid
- Non-Removable rigid dressing
- Immediate post-op rigid dressing
- Vacuum/removable rigid dressing
What does the literature show?
Against Figure of 8 Elastic Bandage Wrapping

Guidance for the multi disciplinary team on the management of post-operative residuum oedema in lower limb amputees. Launched at ISPO/BACPAR/BAPO September 2012.
- Decreased time to achieve wound healing (Deutsch et al 2005, Vigier et al. 1999)
- Provided stump protection from trauma and falls (Deutsch et al 2005)
- Accelerated rehabilitation time (Smith et al. 2003)
- Decreased hospital stays (Vigier et al. 1999)
- Decreased time to initial prosthetic fitting (Vigier et al. 1999)
- Reduced the level of post-op pain more rapidly during recovery (Hidayati et al. 2013)

Supports rigid over elastic compression
Pitfalls with rigid compression

- Dressing application
  - Extra time in the OR
  - Specific technical expertise needed
- Heavy for patient to mobilize
- Inconsistent edema control: need for recasting to accommodate volume reduction (loosening)
- Risk of pressure ulcers
- Limited access to wound (if non removable)
- Can bivalve; need to add socks as limb shrinks
- Custom stump protectors: time intensive to manufacture properly (prosthetic provider)
Ossür Rigid Dressing (ORD)
A vacuum-formed removable rigid dressing

- Made of soft and pliable material
  - 3 PVC interconnected bags filled with granules
- Becomes stiff when air is evacuated
- Velcro straps secure the dressing in position
- Does NOT apply pressure but forms to the residual limb shape after air removal
- Ideal to apply in OR
- Latex free
ORD vs Plaster of Paris Dressings

- **Simple** and fast to apply
- **Light weight** that support early mobilization
- **Control of edema**: continuous control as regularly formed to the stump’s shape
- **Contracture prophylaxis**
- **Easy to clean**
- **Adjustable**: always matches the shape and volume of the residual limb
- **Removable**: allowing regular skin and wound inspection
Used on 10 patients, 7-21 days use

Measurements inconsistent, but all but one reduced edema
- At 1 week: 5 to 7 cm reduction in distal edema; 3-5 cm mid-residuum

Range of motion (flexion contractures)
- 4 no contracture; 2 reduction in contracture

Well tolerated, well liked by patients and NURSING STAFF
- (+) Protection for limb, consistent to apply, comfortable for patient
- (-) Had to educate nursing staff, some moisture build up, top edge irritation

We would like to continue using this…funding main issue
Elastic Tubular Bandage (TG/tubigrip)

- Inexpensive, easy to don and available in the hospital
- Compression can be customized:
  - Low 5-10 mmHg
  - Medium 10-20 mmHg
  - High 20-30 mmHg
- Compression guidelines and sizing charts available on AHS website
- Custom sewn or double reflection
- Replace every 1-2 weeks
Post-Amputation Pain (PAP)

Post-Amputation Pain

- Acute/Sub-acute Pain
  - Post-surgical incisional/operative pain
  - Wound infection
  - Ischemia, claudication
  - DVT
  - Phantom limb pain

- Delayed pain
  - Neuromas
  - Radicular pain
  - Fracture
  - Bursa
  - Heterotopic ossification/bony overgrowth
  - Vascular/ischemia
  - Poor prosthetic fit
  - Phantom limb pain

Eur J Vasc Endovasc Surg 2015: 50, 241-249
Can we prevent post-amputation pain?

- No medications have been shown to be effective at preventing PAP
- Epidural anesthesia reduces postoperative residual limb pain
- Peripheral nerve catheters do not prevent post amputation pain
  - Reduces opioid use by 50%
  - No impact on pain scores

Ann Vasc Surg 2010: 24, 1139-1146
Pain Medicine 2016: 18, 504-519
Phantom Limb Pain (PLP)

- Up to 85% of amputees experience PLP
- Up to 25% experience moderate to severe PLP in the early post-op period
- Risk factors
  - Women
  - UE > LE
  - Presence of pre-amputation pain
  - Presence of pre-amputation anxiety
  - Presence of stump pain
  - Length of time since amputation

Journal of Pain Research 2013:6, 121-136
Phantom Limb Pain (PLP)

- PLP is complex with multiple proposed mechanisms
  - Peripheral: stump and neuroma hypersensitivity
  - Central: spinal cord sensitization and cortical reorganization
  - Psychogenic
- Impairs QOL
- Impedes rehabilitation
- Delays psychological adjustment and return to work
How do we manage PLP?

- Anticonvulsants
  - Gabapentin shows trend towards benefit
- TCA
  - No benefit over active control in PLP but recommended in neuropathic pain
- SNRIs
  - No evidence for use in amputee population but recommended in neuropathic pain
- Opioids
  - Reduces acute PLP by 50%
- Tramadol
  - Low quality studies showing benefit

Cochrane Database Syst Rev 2016 Oct 14;(10)
Non-Pharmacologic Treatment of PLP

- Mirror therapy
  - RCT showing benefit
- TENS
- Psychotherapy / CBT
  - Effective in case reports
- Hypnosis
- Relaxation
- Guided imagery
- Acupuncture
  - Effective in case reports

Pain Res Treat. Published online 2011 Aug 14
Early mobilization

- In-hospital immobilization shown to lead to decline in ADLs among older patients
- Early mobilization starting day of surgery is shown to prevent post-operative complications (contractures)
- Small studies showed increased likelihood of discharge home, better survival and higher motor gains

Journal of Clinical Nursing 2017:26 3286-3297
Protection of the contralateral limb

Prevent wound formation
- Protect the heel in bed (Prevalon boots)
- Re-distribute forces: plastazote insert
- Accommodate deformities: temporary shoe (e.g., DARCO)
- Nail/callous care

Optimize arterial inflow, venous outflow
- Vascular interventions if indicated, risk factor modification
- Compression for edema
Contracture prevention

Home Exercise Program for people with below knee amputations

Repeat each exercise _____ times. Repeat _____ times per day.

1. Lie on your back with your good leg bent and your stump straight. Straighten the knee on the stump side as much as possible by pushing down into the bed and tightening the muscles on top of the thigh. Hold for five seconds.

2. Lie on your back with your good leg bent and your stump straight. Straighten the knee on the stump side as much as possible, then raise your leg off the bed approximately 2 inches. Hold for five seconds.

3. Lie flat with a 6 inch roll under your knees. Push down into the roll and lift your hips off the bed. Hold for 5 seconds.

4. Lie flat with a 6 inch roll under your knees. Straighten each knee, one at a time and hold for 5 seconds.

5. Lie on your good side. Bend your bottom leg. Lift your stump up, keeping your knee straight and your leg back in line with your body. Hold for 5 seconds.

6. Lie on your stomach. Lift each leg, one at a time, off the bed, keeping your knee straight. Do not lift your hips. Hold for 5 seconds.

7. Lie on your stomach. Bend each knee, one at a time.

8. Sit on a firm chair with your hands beside you. Push down through your arms and lift your hips off the chair.
Who will be a prosthetic candidate?

- **Strong Evidence**
  - Amputation level, physical fitness, few medical comorbidities
- **Moderate to Strong Evidence**
  - Able to stand on one leg, no cognition or mood disturbance, pre-amputation living status and cause of amputation
- **Moderate Evidence**
  - Independence with ADL, time to rehabilitation, vascular intervention
- **Weak Evidence**
  - BMI, motivation, social support, smoking and phantom limb condition

Technology and Innovation 2016:18, 125-137.
Discharge

- 65% of patients are transferred to another facility
  - 44% to LTC facility
  - 21% discharged to another inpatient facility including rehabilitation
- 26% discharged home with or without support
- Median length of stay 36 days
  - Median acute care hospital stay 17 days
- Predictors of longer length of stay (> 7 days)
  - Hx of DM, HTN, IDH, CHF, hyperlipidemia
  - Older age
Discharge Considerations

- Glenrose Early Intervention Program
- Housing modifications and equipment
  - Residential Access Modification Program (RAMP)
  - Health Equipment Loan Program (HELP)
- Alternative housing options
- Community resources
  - Peer visitor
  - Amputee support groups
  - Community leisure programs
What is the Amputee Early Intervention Program?

- Interdisciplinary 2 week rehabilitation program for patients with LE or bilateral UE amputations
- Appropriate patients for rehabilitation
  - Potential and desire to use prosthesis in the future
  - Medically stable
  - Mobilizing (1-2 person min assist for transfers)
  - Motivated to participate in rehabilitation
  - Memory intact
  - Multidisciplinary needs
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Prosthetic fitting
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What if they are not a early intervention candidate?
Prosthetic Fitting/ Gait Training

- Inpatient: 4 weeks (BKA) and 6 weeks (AKA or bilateral BKA)
  - Fit with prosthesis
  - Care of prosthesis and residual limb
  - Ambulation with prosthesis
  - Footwear for remaining limb
  - Community reintegration
Questions?

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References


References


