



# *Physiotherapy Following Lower Limb Amputation*

Protocols and Reference Material  
2006

**Prepared by the Physiotherapy Departments in SWAHS – Western Cluster (Nepean Hospital, Blue Mountains Hospital, Springwood Hospital).**

**2006 Rehabilitation Quality Project**

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The information & protocols described in this manual are used at Nepean Hospital for amputee rehabilitation. Often there are differences in protocols for reasons such as surgeons orders, materials or components used, or personal preferences in manufacturing techniques. It should be noted that there is some flexibility in how certain protocols are followed as long as the basic principles are adhered to.

## Pre-Operative Assessment Checklist

Note that a generic *Physiotherapy Amputee Assessment* form has been developed by the NSW Physiotherapists in Amputee Rehabilitation special interest group, & is available on their website [www.geocities.com/nswpar](http://www.geocities.com/nswpar).

### Subjective Examination

- Current History
  - Date, level & side of amputation to be performed.
  - Reason for the amputation.
- Past Medical History
  - Co-morbidities which may impact on prosthetic use or rehabilitation, such as cardiorespiratory illness, diabetes, stroke or neurological illness, musculoskeletal illness such as OA or joint replacements.
  - Smoking history.
  - Medications.
  - Has there been a podiatry review for the other limb?
- Social History
  - Where the client will likely return to after discharge, eg home, hostel, nursing home.
  - Who is at home to assist in ADL's, or could participate / supervise in their rehabilitation.
  - Community supports.
  - Home environment
  - Are there stairs, & with or without rails.
  - Other modifications or equipment, eg rails in shower or toilet.
- Vocational activities
  - Work or recreational pursuits.
  - Driving, and type of vehicle, including automatic or manual.
- Premorbid Mobility Levels
  - Ability to manage bed mobility, transfers or standing up.
  - Is an aid or assistance required?
  - What terrains can be negotiated – household, community, grass, stairs, crossing road, shopping, etc.
  - Endurance levels: is the client usually a household ambulator, outdoors, or community ambulatory, and what are the limiting factors?
  - Is there a history of falls, and contributing factors.
- Pain
  - Pain in affected leg / unaffected leg.
  - Any other areas of pain
  - Consider patterns of pain and possible effects on the rehabilitation process.
  - May need to take a VAS scale.

- Goals
  - May or may not include prosthetic gait. Other goals can be wheelchair independence, transfer independence, improving bed mobility, etc.

## **Objective Examination**

- Joint Range of motion
  - Lower and upper limbs.
  - Active
  - Passive
- Muscle Lengths
  - Main muscles at risk of shortening include hamstrings, hip flexors, intact limb plantarflexors.
  - Also consider risk to hip abductors / external rotators in above-knee amputation.
- Muscle Strength
  - Assess by manual muscle test or functional testing.
- Condition of intact limb
  - Strength & range of motion
  - Presence of vascular disease – ulcers, claudication.
- Arm Function
  - Strength & range of motion.
  - Ability to use arms during transfers and with walking aids.
- Functional Assessments
  - Bed mobility
  - Sit to stand and transfers.
  - Gait, including ability to hop.
- Chest assessment.

## **Instructions on Post-Operative Exercises and Positioning**

- Short term goals include:
  - Maintenance of respiratory function
  - Maintenance of strength
  - Maintenance of range of motion & muscle lengths
  - Maintenance of cardiovascular fitness.
- See section: Acute Management of Amputees
- The client will likely also want information on the rehabilitation process and prosthetic limbs.
- Advise the client about the Amputee Association of NSW. The association can also be contacted for visits by other amputees for advice and peer support.

## Post-Operative Assessment Checklist

Contains all aspects of the pre-operative assessment, if it could not be completed prior to the amputation surgery.

Also includes:

- Level and date of amputation.
- What hospital & surgeon performed the surgery.
- Assessment of the amputation stump

The full nature of this part of the assessment may depend on the time since amputation and ability to access the stump due to the type of dressings.

- Skin integrity
  - Presence of open wounds
  - Surgical wound healing
    - Sutures, or date of removal.
    - Scabs – size and location on the suture line.
    - Open areas – size and location. Include areas of ulceration, trauma, delayed healing or wound dehiscence.
  - Areas of redness / inflammation / infection.
  - Skin or scar tethering and adhesions
    - The skin must be mobile to protect against friction when wearing a prosthesis.
  - Areas of sensitivity.
  - Areas of reduced sensation.
    - This includes proprioception, which is compensated for distally in the amputated limb by the sensation of pressure on the stump, and sensory feedback regarding the fit of the prosthesis, i.e. pistoning of the socket indicating looseness, or areas of increased pressure or friction leading to skin damage. If sensation is impaired, staff and the amputee must be more diligent in checking skin integrity during prosthetic training.
  - Presence of bony prominences.
    - These must be taken into account when casting & fitting a prosthesis, as they will not be tolerant to pressure.
  - Range of motion.

- Oedema
  - Type of post-op dressings / management used: rigid dressing, soft dressing, stump bandaging or shrinkers.
  - Presence of dog ears
  - Amount of oedema – surgical and dependent.
  - Bandaging technique, if appropriate.
  - Assessment of oedema:
    - Select a bony landmark, and take circumferential measures at fixed points down, eg every 3cm from inferior pole of patella.
- Pain
  - Residual limb or stump pain.
  - Phantom pain or phantom sensation.
  - Generalised
  - Localised
  - Type of tissue affected – bone, soft tissue, nerve / neuropathic / neuroma pain.
  - Type & effectiveness of pain relief.
  - Patterns of pain. May also need to use a VAS scale.
- Post-amputation mobility levels (without prosthesis)
  - Bed mobility
  - Sit to stand and transfers (including sliding transfers if appropriate).
  - Gait (hopping) with frame or crutches, including negotiation of stairs.
  - Wheelchair mobility & transfers
  - Ability to get up from the floor.
  - AmpNoPro score
- The client's weight.
- Technique and compliance with maintenance & mobility exercises.

If the client already has a prosthesis, add the following to the assessment:

- Ability to don / doff the prosthesis correctly, including ability to monitor areas of pressure / weight bearing, and correct number of stump socks.
- Amount of time the prosthesis is used daily.
- Functional mobility measures, for example:
  - Prosthetic weight bearing (% of body weight).
  - 10m walk test.
  - Timed up & go.
  - 6 min walk test.
  - AmpPro score.

# Acute Management of Amputees

## Positioning

Goal: Prevent contractures by avoiding prolonged knee flexion and hip flexion.

From Day 1:

- Prone lie for 30 mins if tolerated.
- Knee extension
- Hip extension
- Backslab or conventional rigid dressing for short BKA stump or in cases of flexor spasm (if appropriate).
- No pillows under affected limb when in bed.
- No crossing legs in bed.
- When sitting out of bed: avoid prolonged knee flexion – keep stump supported on leg rest or leg board in wheelchair

## Chest

Pts often have pulmonary co-morbidities. Treat as appropriate.

From Day 1: Chest maintenance DB X's

## ROM and Strengthening

Goal: maintenance of strength, and range of motion.

Prescription depends on assessment findings, but a basic programme should include, as a minimum:

- Ankle pumps intact limb
- Static quads
- IRQ
- Knee flexion / extension
- Hip extension / abduction
- Abdominals; core stability
- Upper limb ROM; bed / chair pushups; monkey bar pull-ups.

For all hip and knee muscle groups bilaterally; trunk and upper limbs



## **Early Mobility and transfers**

Early ambulation is desirable to decrease effects of bedrest especially in the elderly. (DVT, pressure areas, contractures and deconditioning)

Use of FASF in initial stages provides stability to overcome altered centre of mass and effects of pain

- Bed mobility practice if appropriate
- Sit to stand practice into FASF or PUF, as appropriate.
- Practice transfers from bed- chair/ commode using:
  - Pivot transfers
  - FASF
  - slideboard
- Early mobilisation in FASF, weight bearing on intact limb
- Progress walking aid as able

## Oedema Management

Oedema forms following an amputation due to an inflammatory response. Exudate arises from soft tissue and medullary bone, as well as bleeding, causing the stump to swell. This type of oedema peaks in the first week.

Amputees are often predisposed to oedema due to pre-existing vascular disease, and a reduced capacity for venous return. There is also an increased risk of dependent oedema due to immobility of the limb and the patient in general, and the effects of gravity during prolonged sitting.

Oedema reduction is critical in amputee management. It contributes to:

- Pain reduction through desensitisation and reducing stump interstitial pressure.
- Wound healing by reducing stump interstitial pressure, preventing wound dehiscence, and improving circulation.
- Reduced risk of infection.

Prevention of stump oedema following surgery is crucial, and can hasten progress through rehabilitation. Oedema management involves a combination of treatment modalities:

- Use of rigid dressings / removable rigid dressings immediately post-operatively.
- Stump bandaging.
- Use of stump shrinkers.
- Compression therapy – pumps, elevation.
- Massage.
- Newer techniques involving use of silicone or polyurethane sleeves / liners, including the TEC system.
- Use of temporary or interim prostheses.

The amputee is usually not prescribed or fitted for a definitive prosthesis until the stump oedema is minimised and stable at that minimal level.

## **Rigid Dressings / Removable Rigid Dressings**

Achieving primary wound healing as quickly as possible is of major importance following lower limb amputation. Several studies have noted that, as most amputees are of a vascular nature and the life expectancy of this group is limited, it is desirable that rehabilitation proceed as quickly as possible (Stewart et al, 1992, quoted in Chakrabarty, 1998; Munin et al, 2001). A prolonged period of rehabilitation may take up a major proportion of the amputee's remaining life. Cost savings made from less health resource consumption by achieving optimum outcomes over a faster timeframe could be significant, while prevention of secondary complications such as worsening cardiorespiratory co-morbidities, loss of strength and fitness, joint contractures, and pressure areas will significantly reduce the amount of resources needed to achieve these outcomes.

In transtibial amputation preservation of the knee is crucial in order to retain as much function as possible. Literature abounds with information stating that functional outcomes for above-knee amputees are significantly worse than below-knee in terms of mobility levels achieved, long-term use of the prosthesis, length of stay, and length of the rehabilitation process (Chakrabarty, 1998; Wu & Flannigan, 1978; Hubbard 1989).

Rigid dressings are purported to be successful in achieving wound healing faster and with less complications than soft dressings. These can be fixed, thigh-level casts, or shorter removable casts. Most studies are descriptive (Wu et al 1979, Wu et al 1987, Mooney et al 1971, Richter et al 1988, Swanson 1993, Hughes et al 1998, Mueller 1982). There is a paucity of randomised controlled trials investigating use of rigid dressings, although one (Deutsch et al 2005) found a strong trend towards earlier healing with use of removable rigid dressings.

### **Advantages for rigid dressings are:**

- Provides a closed environment to minimise risk of infection.
- Aids healing by reducing movement at the skin edges and preventing wound dehiscence.
- Minimises dressing changes and potential for damage to the wound.
- Protects against trauma against bed rails or falls.
- Minimisation of stump oedema.
- Reduces pain by supporting the stump.
- Prevention / reduction of knee flexion contractures.

### **Disadvantages of rigid dressings are:**

- Need for trained surgeon / physiotherapist / prosthetist to apply them in theatre.
- Closed environment limits wound inspection.
- Lack of continuing progressive compression for stump shrinkage.
- Development of knee stiffness if used over prolonged periods.
- Need for re-application 15-20 minutes after removal for stump inspection.
- Removal involves use of a plaster saw close to fragile skin / wounds.

**The removable rigid dressing has additional benefits of:**

- Ease of patient application.
- Allows visual inspection of the stump wound.
- Allows maintenance of knee flexion ROM.
- Is easily adjustable to accommodate changes in stump volume through use of stump socks.

**The removable rigid dressing has additional disadvantages of:**

- Does not maintain the knee in extension (contracture prevention).

The NSW Artificial Limb Service (ALS), in a review of services provided to amputees, recommended that “the use of rigid dressings (fixed or removable) in the management of the residual lower limb be encouraged as standard practice in NSW amputee services.” (Stewart et al, 2004).

Casts may be applied using plaster or rolls of synthetic casting material, although plaster is recommended for fixed dressings. Also available is synthetic tubular socks, which is a stretchable sock impregnated with polyurethane resin, such as Shapemate, supplied by Reis Orthopaedics. These can be rolled on to create removable rigid dressings.

Rigid dressings are to be worn constantly, except for routine changes of cast to allow wound inspection (see protocol). There are special circumstances for removal outside set periods which must be adhered to.

Removable dressings are to be worn at all times except when bathing, inspecting the wound, or dressing changes.

Both types of dressings must be off no longer than 20 minutes, otherwise oedema can develop.

**Removable dressings will require staff & patient education r.e. donning, doffing, monitoring fit, monitoring pressure and the wound.**

## Application of Rigid Dressing for Below Knee Amputees

- **Apply a dry, sterile dressing over the wound.**
- **Apply a thin layer of padding (1-2 layers) over the stump up to the level of mid thigh. Ensure there are no wrinkles in the padding.**
  - When applying the rigid dressing in theatre, use the sterile padding and tubinette from the plaster trolleys in theatre.
- **Apply two single layers of stockinette / tubinette over the padding. Fold or tape the ends of the tubinette down, ensuring there are no significant ridges which could lead to pressure.**
  - This is the reverse of normal casting, as during removal the plaster saw blade will not penetrate the stockinette, thus the skin is protected by the padding below the stockinette.
  - Do not apply 2 layers by twisting off a single length of tubinette, as this will leave a lump at the end of the stump, which could create a pressure area.
  - Any surgical drains or epidural catheters should go over the padding, but can be underneath the tubinette.
- **With the knee in extension, apply a 10cm Elastik plaster in a figure-8 pattern, fully enclosing the stump, up to approximately 10cm above the patella.**
  - The Elastik plaster can be stretched to approximately half its elasticity without getting too tight.
  - The amputee should not elevate their own limb, as activating their quads will cause the muscle to tense, leaving the cast too loose after they relax. Use a second person to hold the stump.
- **Apply 1-2 rolls of normal 10cm plaster bandages in a figure-8 pattern, fully enclosing the stump up to approximately 10cm above the patella.**
- **Mould the plaster above the femoral condyles, to ensure a firm fit and stop rotation or slipping of the cast.**

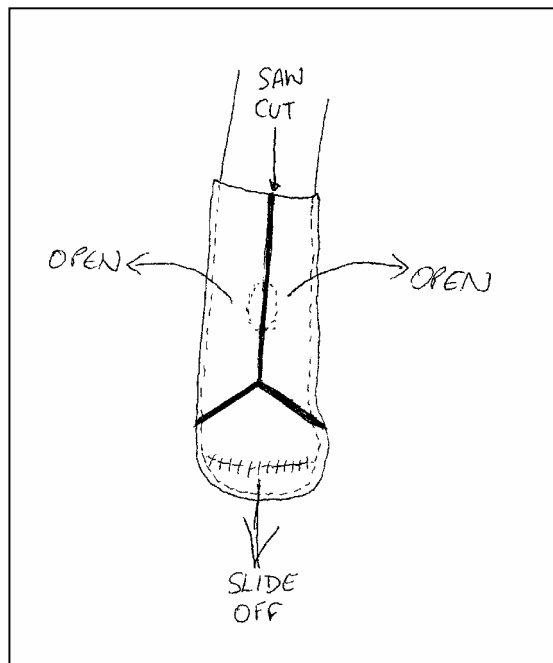
## Protocol for Removal of Rigid Dressing

- Standard protocols call for removal of the rigid dressing around day 3 post-operatively, and then weekly following the first change, allowing the wound to be viewed, and any drains or lines removed, and removal of sutures if ordered.
- **The rigid dressing must be reapplied within 20 minutes of removal, to prevent build up of stump oedema.**

## Procedure for Removal of Rigid Dressing

Requires a plaster saw, spreaders and scissors.

- Use the plaster saw to create a Y-shaped cut down the front of the stump, with the branches beginning approximately 5cm below the patella and heading laterally. **This is done to ensure that the saw blade never passes over the wound.**
- Insert the spreaders into the anterior cut, and crack the plaster, opening the two side pieces. As the plaster should be relatively thin, it should crack easily.
- Cut the padding and stockinette / tubinette with scissors, and slide the cast off distally.



## **Indications for Removal of Rigid Dressing Outside Set Periods**

Removing the cast outside set periods may affect the objectives of the protocol, i.e increases the risk of exposure to infection, trauma with another dressing change, and build-up of oedema. Taking off the cast just to “have a look” outside set periods should be avoided.

**Removal outside set periods should only occur under the following circumstances:**

- **Localised pain described as “burning” or “throbbing”, which is distinguished from normal post-operative pain, and is not relieved by elevating or supporting the stump. (General pressure all around the stump can be considered normal).**
- **Foul odour or excessive bleeding.**
- **Presence of low grade temperature over a few days, indicative of infection, where other possible causes have been excluded.**
- **Loose cast, allowing movement or rotation of the stump within the cast.**
- **Too tight a cast, where one is unable to insert a finger under the proximal rim of the cast.**

**The cast should not be removed if not satisfying these criteria.**

If the above are suspected, contact the vascular team for an urgent review. Do not remove the cast unless ordered to do so.

If the cast is removed because problems with the wound are suspected, do not reapply the cast after review. Nursing staff should apply the standard soft dressing.

## Further notes regarding Dr Hall's Patients

Dr Hall's surgery days are Monday mornings and Thursday afternoons. None are likely to be emergency amputations, so review of theatre lists can increase the amount of notice regarding when rigid dressings in theatre are required.

The rigid dressings will only be applied in theatre during normal working hours, i.e 8:00 to 4:30. As Dr Hall routinely does the amputations last on his list, if they go over time, ask that soft dressings be applied and these amputees will be classed as controls in evaluation of the protocol.

Dr Hall does not insert surgical drains in the amputation stumps. He does, however, use an epidural catheter inserted into the nerve as pain relief.

Standard protocols call for the first change on day 2 or 3. Dr Hall does not usually view the wounds until day 7. The rigid dressing could therefore be left on until day 7 or as negotiated with the vascular team, unless problems arise.

The epidural catheter must be removed when ordered. As it is not sutured in, Dr Hall is happy for it to be pulled out from the top of the cast. If it does not easily pull out, the rigid dressing will need to be removed to get it out, but protocols for reapplication, i.e **within 20 minutes** must be observed.

Times for weekly removals should be negotiated with the registrar and nursing staff by the ward Physiotherapist. Dr Hall has stated that he need not always be present for viewing of the wound – he will trust the judgement of the Registrar and Physiotherapist, and that if the cast is reapplied, he will assume that nothing untoward is happening with the wound healing process.

Application of rigid dressings will not take place after hours or on weekends, but emergency removals may be requested by the vascular team if criteria are met.



## **Application of Removable Rigid Dressing for Below Knee Amputees**

- **Seat the patient comfortably, with intact limb supported. The residual limb should stay relaxed throughout the procedure.**
- **Apply a dry, sterile dressing over the wound.**
  - Use a dressing with minimal bulk.
- **Put stump sock on over the dressing. Attach suspender to sock and around waist, or ask the patient to firmly hold sock on.**
  - Use a thinner stump sock initially.
- **Apply relief padding over bony prominences if necessary.**
  - Tibial crest.
  - Head of fibula.
  - Tibial shelf.
  - Distal tibia / fibula.
  - May also decide on relief over the suture line.
- **If the residual limb is bulbous distally, pad the sides with softban, felt or other material to ensure straight medial & lateral edges so that the cast can be slid on & off without too much force.**
- **Wrap residual limb / sock in gladwrap.**
  - Do this so casting material does not stick to the sock.
  - Allows easier removal without risk of deforming the damp cast.
- **Add a layer of tubifast / stockinette.**
  - This forms the internal layer of the cast when using plaster.
- **Mark proximal trim lines if necessary.**
- **Apply the casting material in a figure-8 pattern.**
  - The cast should reach mid-patellar level anteriorly, and be low enough to allow knee flexion posteriorly.
- **When dry to tap, slide off the cast, trim or fold proximal edge as necessary.**
- **Reapply when dry, with appropriate number of stump socks.**
  - In some occasions, the stump shrinker may be worn beneath the cast.
- **Use tubigrip, straps, or a supra-patellar thermoplastic cuff for suspension.**

## **Notifying Physiotherapists of an Amputation Requiring a Rigid Dressing**

Dr Hall's Registrar or theatre will ring 42140, notifying the dept that a below knee amputation is occurring. They may ring beforehand, or on the day.

### **Need to find out:**

**When the amputation is occurring.**

**What time they will need the Physiotherapist to apply the rigid dressing.** If it is going to be after 4:30, see next point below.

**Rigid dressings will not be applied after hours.** If it is requested, please inform the Registrar that this has been agreed to by Dr Hall, and a soft dressing applied. These patients will then be used as controls in evaluating the protocol. If they are insistent, put them on to the most Senior Physio available, who will reinforce this.

Page a Physiotherapist to notify them that an amputation is occurring and a rigid dressing is required in theatre. As the amputees generally end up on level 4, try those Physios first.

Orthopaedic Senior	(#14765)
Neuro Senior	(#14762)
Senior in Inpt Rehab	(#14492)
Senior in ICU	(#14915)
Outreach Physio	(#14433)
4A / 4C Physio	(#14722)

Some help with workload of the Physio attending theatre may need to be negotiated with the other Physios.

Times for changing rigid dressings will be negotiated with the vascular team.

## **ProTECtor System**

These devices consist of a urethane sleeve (the TEC skin), a plastic pre-fabricated stump proTECtor, and optional retainer. The TEC skin is rolled onto the stump, over a thin wound dressing, and the adjustable proTECtor secured over the top. The retainer can then be fitted over the top for weight bearing transfers or attachment of components to create an IPOP (immediate post-op prosthesis).

Stump shrinkers can be fitted over the top of the TEC skin for further compression (use a Daw sheath to assist in donning).

### **Advantages of the ProTECtor system:**

- Off the shelf convenience.
- Protection against secondary trauma.
- Promotes oedema reduction, with or without a shrinker.
- Assist in pain relief.
- Enhances residual limb maturation by promoting circulation.
- Can have attached pylon for controlled weight bearing.
- Even distribution of pressure around the stump.
- Improved independence through ease of application.
- An extra attachment – the “Immobiliser”, extends above the knee for prevention of contractures.

### **Disadvantages of the ProTECtor system:**

- Cost of establishing a store of each size and left/right.
- No published trials regarding benefits or effectiveness.
- Fit of the proTECtor is not always as good as a conventional RD or RRD, or a temporary prosthesis.
- Concern over application of the TEC skin over a fresh, painful stump.
- Not suitable for more advanced mobility training.

The ProTECtor system can be purchased through APC Prosthetics, Northmead.

There are other types of silicone / urethane sleeves being tested to promote wound healing, however, these are also expensive & not covered by the ALS.

## Bandaging

There is a need to assess each patient and their situation individually. Commencement of stump bandaging can depend on the state of wound healing, or on orders from the vascular team. If in doubt, check with the vascular team, but ideally oedema control should begin as early as possible.

- Prior to removal of stitches, a crepe bandage, rigid dressing or removable RD is used. There are occasions when the Elset bandage can be applied *over* the soft dressing.
- Once stitches out and wound almost healed can start with Elset (lighter than Conco) or Conco bandages. See attached handout for the AKA/BKA bandaging methods. As a guideline, 10 cm width bandage for BKA; 15 cm for AKA, although this should be subject to individual stump sizes.
  - The patient, nursing staff and carers should be instructed (in services, handouts etc.) on correct bandaging technique. Research has highlighted that the greatest range of pressures were found when bandaging was done by the unskilled. Uneven pressure distribution can even cause damage to the stump, therefore correct application is essential.
  - The stump should be inspected for pressure areas, bruising or abrasions prior to bandaging. The stump should be dry before bandaging begins. Ensure all creams used for massage are removed before applying bandage.
  - Bandages re-applied at least 4x a day, or more often if bandage loosens or is too tight.
  - Shrinkers and bandages should be washed on a daily basis.
  - Bandages/shrinkers to be worn all the time when not using prosthesis for the first 18 months to 2 years.
- Shrinkers have been shown in some studies to maintain the shape of the stump & reduce oedema better than bandages.
- When wound is completely healed then shrinkers can be used. Because of shear or traction forces that can be applied across the wound during donning / doffing a shrinker, care must be taken to ensure that the shrinker is of correct size, that the surgical wound is mature enough not to be pulled apart, and that any scabbed areas are not damaged. Until then, use of bandages is recommended, as long as correct application technique is ensured.
- Ensure that patient and/carer has information on how to care for and apply shrinker.

## **Suppliers of bandages and shrinkers**

Prices vary so need to check out best deal. Also contact details can change.

- APC prosthetics – (02) 9890 8123
- Appliance and Limb Centre – (02) 9319 1955
- Premier Prosthetics & Orthotics Ltd – (02) 9649 4177
- Reed Prosthetics & Orthotics Pty. Ltd – (02) 4423 2475
- Southern Prosthetics & Orthotics Pty. Ltd – (02) 4272 1444
- Wright Orthopaedics Pty. Ltd - (02) 4962 2083
- Hunter Prosthetic & Orthotic Service – (02) 4921 4151
- Greater Murray Health Service Prosthetic & Orthotic Dept. – (02) 6041 1022
- Hallam, P.O. Box 565, Riverwood 2210 - (02) 9584 4344 (supplies Elset bandages)

Shrinkers can be purchased privately and correctly sized and fitted by Southern Prosthetics when they attend Governor Phillip for amputee clinics. They can also arrange for custom-made shrinkers for those with larger stumps who do not fit standard sizes.

### **How many?**

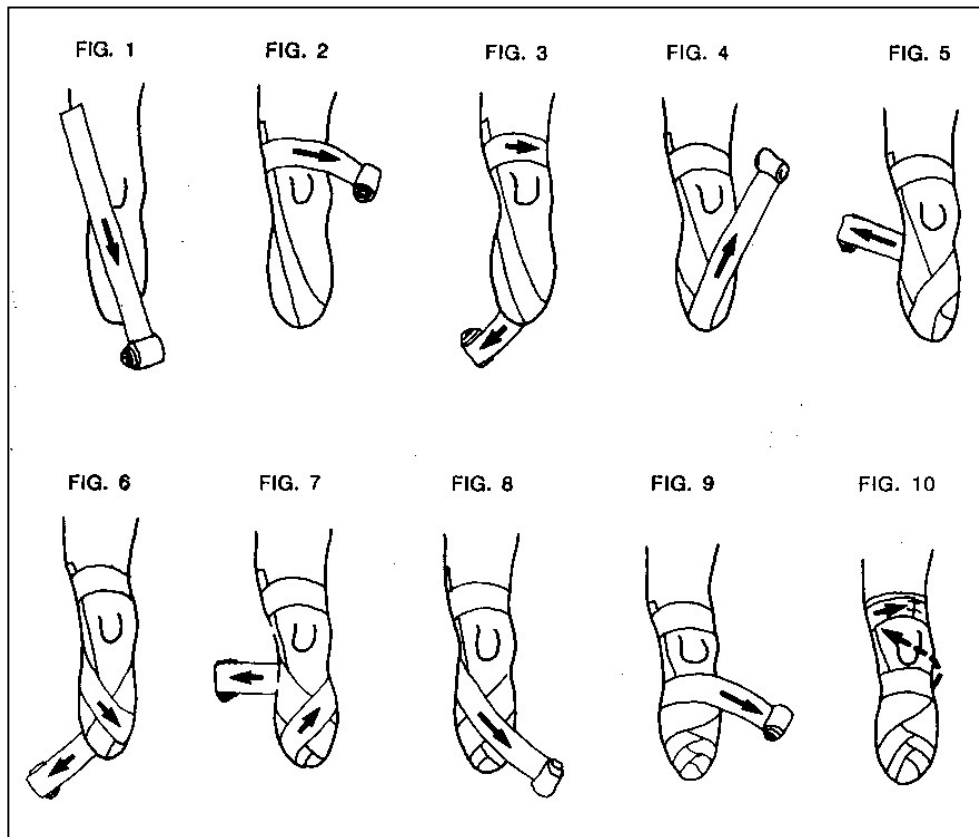
The current policy in SWAHS (Western cluster) is:

Inpatient – 2 bandages and once using shrinkers then the patient will need 2 to allow daily washing. These should be supplied by the hospital.

Outpatient – will need 2 bandages/shrinkers. The hospital should supply 1 and if possible the patient should pay for the second. A flexible approach is needed so as not to discriminate against those who are unable to meet the costs.

Physiotherapy on Governor Phillip campus has a store of shrinkers for AKA & BKA.

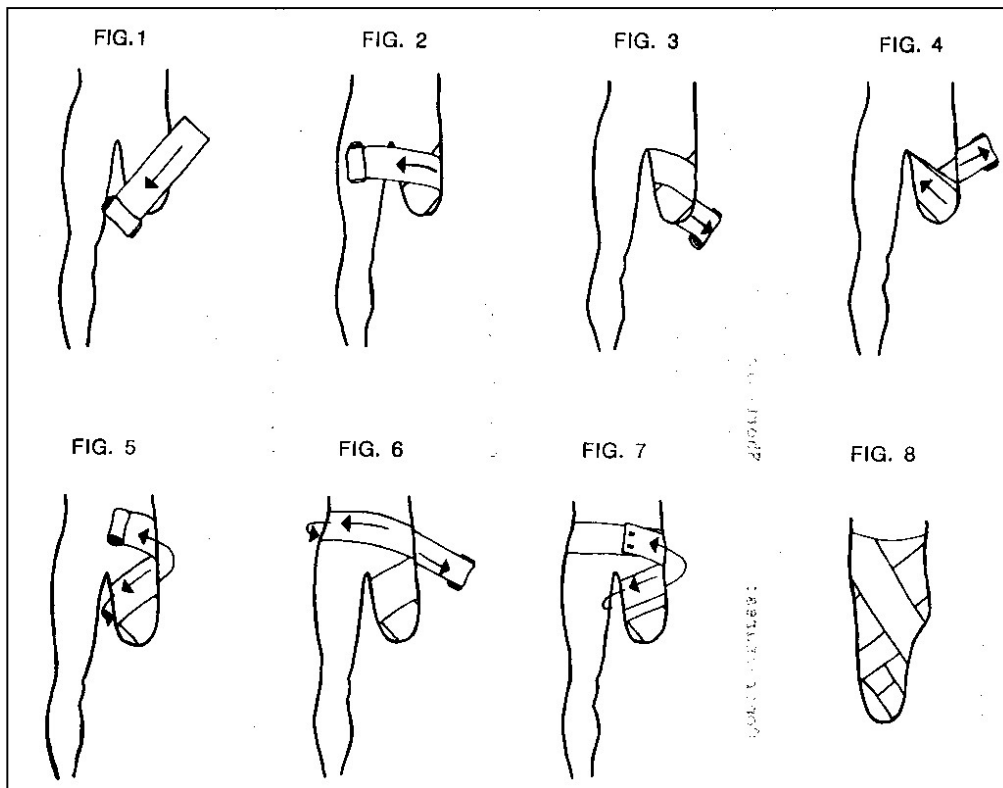
## Bandaging for Below Knee Amputation



Use one 10cm concho / elastic bandage. There may be differences between people in exact technique, but the basic principle is to bandage using a figure-8 technique, with pressure decreasing as the bandage moves proximally. The patella should not be enclosed, and the knee able to fully flex and extend after application.

- Hold the knee straight, and begin on one side (other techniques may begin above & behind).
- Move diagonally to the bottom (fig 1), then back up behind the knee (fig 2). Wrap around once or twice above the knee to secure the bandage, loosely so as not to act like a tourniquet (fig 2 & 3).
- Bring the bandage diagonally back to the bottom of the stump (fig 3) then diagonally back up (fig 4).
- Cross behind the stump, below the knee (fig 5).
- Continue with diagonal turns to cover the entire stump evenly (fig 6-9). Ensure there is more pressure distally to shape the stump and reduce 'dog-ears'. Each diagonal turn should be several millimetres higher than the last.
- Finish by fastening the bandage above the knee with tape (fig 10). Metal fasteners should not be used due to risk of scratching the skin (particularly with vascular amputees).
- Check that the bandage has no folds or creases, particularly over the end of the stump.

## Bandaging for Above Knee Amputation



Generally, use one 15cm concho / elastic bandage, although with shorter stumps a 10cm bandage could be used. There may be differences between people in exact technique, but the basic principle is to bandage using a figure-8 technique, with pressure decreasing as the bandage moves proximally. Bandaging must continue to fully enclose the stump, right up to the groin, to prevent formation of an adductor roll.

- Start on the inside or outside of the stump, & move down diagonally (fig 1).
- Cover the end of the stump, pulling the bandage to add tension and apply pressure. Cross to the other side of the stump, ensuring the bandage is covering the stump right up in the groin (fig 2).
- Continue with diagonal turns, covering the remaining stump. Each turn should be several millimetres higher than the last (fig 3-5).
- Place the next turn up around the waist to secure the bandage (fig 5-6).
- Finish by fastening the bandage above around the waist with tape (fig 7). Metal fasteners should not be used due to risk of scratching the skin (particularly with vascular amputees).
- Check that there is no loose skin in the groin area, and that the bandage has no folds or creases, particularly over the end of the stump.

## Measuring Stump Size for Shrinkers

The following table is for Juzo brand stump shrinkers.

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## **Massage**

Massage is one modality used in post-amputation stump care. Tapping and desensitisation with towels or cotton balls can also assist.

### **Demonstrated Advantages of Massage**

- Non-invasive, and can be self-administered.
- Reduces oedema.
- Increases local circulation.
- Reduces muscle stiffness and stretch other soft tissues.
- Reduce scar tissue tightness / adhesions / tethering.
- Decreases stump and phantom pain.
- Desensitisation of painful areas.
- Desensitisation of neuromas.
- Decreased stress and anxiety.
- Acclimatise the stump to being touched or pressure.

### **Massage for Pain Relief**

- Post-amputation pain is multifactorial, resulting from surgical trauma, complications of wound healing, tissue loading effects, local scarring, and central neuropathic factors.
- Phantom pain is the perceived presence of the amputated part. As the aetiology of phantom pain remains elusive, treatment should include the least invasive and least expensive therapies.
- Massage is effective at many levels of pain – tissue level, cognitive level, and nerve level (pain gate). It increases sensory input from the residual limb and may override the brain's perception of pain (musculoskeletal and phantom). Early massage can help develop tolerance of the residual limb to touch and pressure.
- Psychological factors have been shown to contribute to phantom pain which can also be magnified by stress. Massage has been proven to be an effective tool in the reduction of stress.
- There are also mechanical effects of massage which work to decrease pain at local sore points or the site of nerve hypersensitivity and neuroma formation.

### **Massage for Oedema**

- Oedema can cause increased pain, delay healing, and increase risk of infection by increasing stump interstitial pressures.
- Oedema (excess fluid) can compress soft tissues in the stump and affect prosthetic fit.
- Poor circulation in the stump due to oedema increases the risk of further tissue damage and pain.

## Massage for Scar Tissue

- Scar tissue is less elastic and often thicker than normal skin. If causing a restriction, scar tissue will have a negative effect on adjacent tissues.
- Entrapment of nerves and scar tissue can occur during the healing process and pain is exacerbated by shear forces or direct pressure on these tissues.
- Pain from a neuroma (nerve regrowth at the amputation site without the axonal sheath) is often worsened if it is trapped in scar tissue. Massage has been successfully used to manage scar tightness and entrapment of neuromas.
- There have been reports of increased scar pliability and decreased scar banding with the use of friction massage.

## How to Massage

1. For Oedema:
  - Massage the residual limb using a firm “stroking” or “kneading” motion with both hands. Work from distal to proximal to aid the movement of excess fluid. Take care over the suture line not to damage the wound or knock off any scabs.
  - Pay particular attention to areas of hardness, indicating presence of dependent oedema.
2. For Scar Mobilisation
  - Place index and middle fingers on the suture line (only over healed areas).
  - Press firmly (until your fingernails blanch) and move fingers across the scar perpendicularly or in circles. Continue along the length of the scar.
  - Prior to the scar being fully healed, this technique should be used on the adjacent tissue.
  - Patino et al (1999) found 10min of friction massage over a scar per day for 3 months to be ineffective, so amputees should be encouraged to do at least 10 minutes per day, with recommendations of 5 minutes, 3-4 times daily.
  - The scar and adjacent skin must be mobile, to protect against friction of the interior socket rubbing across the skin whilst wearing the prosthesis.
  - If using sorbolene or other creams, ensure the stump is cleaned and dry before reapplying bandages/shrinkers or stump socks.

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# Advice for Amputees: Care of the Stump and Prosthesis

## Care of the Stump

Skin care is important for all amputees, not just vascular amputees. Cracks, blisters, ulcers, pimples, or tethered scars can not only be painful, but may mean a period where the prosthesis cannot be worn as wounds heal.

Some basic rules:

- Cleanliness is important. The stump is often fully enclosed in bandages / shrinkers, or total contact sockets, making evaporation of sweat difficult. Bacteria thrive in moist environments, and if there is a wound or skin tear, infection can occur.
- Wash socks, nylon sheaths, bandages, and shrinkers daily, as per manufacturers guidelines. Prosthetic components, including gel socks, sockets & liners, and any other components which contact the skin, should be cleaned daily as per manufacturers guidelines
- Massage regularly to reduce scar adhesions and improve circulation. Remove all residual creams and lotions after massaging.
- Once the adhesions are reduced, use softening lotions only if the skin is at risk of cracking or peeling.
- Wash the stump daily (or more often if necessary) with mild or antibacterial soaps. Rinse well.
- Do not shave your stump as there is a risk of ingrown hairs, which provide a source for infection.
- Do not use alcohol based cleaning products, deodorants or perfumes, as they can dry the skin and lead to cracking.
- If there is a wound which requires a dressing, use the thinnest possible. Bulky pads or dressings will cause an increase in local pressure inside the socket.
- Do not remove scabs. Do not open blisters. Seek medical advice on the management of wounds or blisters. It may be necessary to stop using the prosthesis, until reviewed by the prosthetist for correct fit.
- Adding padding to reduce pressure areas will actually have the opposite affect, causing increased pressure.
- Carefully monitor your skin, and the fit of your prosthesis. Small changes in stump shape or volume can be managed with additional stump socks, but larger changes require modification by the prosthetist. If skin damage is occurring, continued use of the prosthesis should be avoided until reviewed and modified by the prosthetist or, in the case of temporary prostheses, the physiotherapist.
- Monitor changes in body weight, as they will affect the fit of the socket, particularly vacuum or suction sockets.

## **Care of the Prosthesis**

- Clean all components that contact the skin regularly. Hard sockets can be wiped with a cloth dipped in soapy water. Dry the socket afterwards. Socks, gel socks, sheaths, silicon liners should be washed according to manufacturers guidelines.
- Do not get the prosthesis wet. Foam or soft coverings can perish, including the heels of SACH feet, and metal components rust, particularly when exposed to salt water.
- Do not let plaster temporary prostheses get wet. The plaster will soften and the socket will be unsafe to use.
- Do not make any self-adjustments to the socket, or the alignment of the prosthesis.
- Monitor the prosthesis for fit and comfort. Visually check all visible components regularly for wear or breakage. Report any signs of breakage or any noises to the prosthetist or physiotherapist.

## Beginning Prosthetic Training

### Is the patient ready to begin prosthetic training:

There are no rules as to who should have a prosthesis and who should not. The ALS will provide a definitive prosthesis for all lower limb amputees who are prescribed one from an accredited clinic.

The decision of if and when to proceed with prosthetic training may require input from all team members, including the vascular and rehabilitation medical specialists, physiotherapists, nursing staff, podiatrist, occupational therapist, and prosthetists.

The following considerations should be taken into account:

- Check stump condition
  - Wound is closed and sufficiently healed to safely begin weight bearing in a total contact cast. The suture line can still have some scabbed areas, as long as the scabs are maturing and not fragile where they will be easily dislodged, and they are not in high-risk areas, such as directly over the distal end of the tibial remnant or other bony prominences or weight bearing surfaces.
  - Skin integrity is adequate for weight bearing and there are no abrasions/skin tears on weight bearing surfaces or location of straps. In the case of skin grafts in high-risk areas, confirm with plastics team prior to commencing prosthetic use.
  - Stump shape is appropriate for prosthetic use – a bulbous stump where the distal end is wider than the proximal end will make donning a plaster temporary prosthesis difficult. Ensure there is no gross oedema (oedema management has been commenced).
  - Patient is able to tolerate sufficient pressure on stump to begin weight bearing.
  - Pain is reasonably under control.
- Premorbid mobility levels: if the client could not walk before the amputation, it is unlikely they will be able to walk with a prosthesis. The exception here is when they could not walk due to pain / deformity in the limb that has since been amputated.
- ROM considerations (intact and amputated).
  - Patient has sufficient ROM in residual limb to allow upright standing with prosthesis. TTA <20° knee flex contracture, TFA <10° hip flexion contracture.
  - Intact limb has sufficient ROM of dorsiflexion, knee extension, and hip extension, to allow upright standing to commence prosthetic training.

- Strength and fitness
  - Patient has sufficient strength (power and endurance) on intact side to begin prosthetic training – patient is able to stand up with minimal assistance. Ability to hop with a walking aid is advantageous but not always essential.
  - Patient has sufficient strength in residual limb to begin prosthetic training – MMT >4/5 extensors.
  - Patient has adequate cardiovascular fitness to allow sufficient practice with prosthesis to see improvement in performance.
- Patient does not have other medical conditions/issues that will prevent prosthetic use or training, eg poor cardiovascular function, severe PVD / ulcers on intact foot limiting ability to weight bear.
- Cognitive function – Is the patient able to learn and understand complicated tasks such as gait retraining and safety in using prosthesis. Are there medical issues affecting cognitive function eg dementia, stroke.

Also consider:

- Social situation – Does the patient have a supportive home environment to encourage prosthetic training? Does patient have a carer to compensate if the patient is unable to monitor residual limb and prosthetic fit or assist with prosthesis application?
- Attitude and motivation. – Will the patient be compliant with exercise program? Is the patient prepared to put in the hard work necessary to learn to use a prosthesis? Does the patient want a leg? Will the patient listen and adhere to safety instructions and use prosthesis correctly?

In some cases a limb can be provided through the ALS for cosmetic purposes only, but this is not guaranteed.

### **Who can make the temporary prosthesis?**

#### **PHYSIOTHERAPISTS:**

Transtibial and Transfemoral amputations requiring plaster temporaries:

At present, several staff are being trained to make temporary prostheses. Speak to the inpatient (ext 42087) or outpatient (ext 43949) rehabilitation seniors for names and availability.

Transfemoral temporary prostheses will be best cast at Governor Phillip, as all equipment (including quad socket inlets) is at that location. Transport will need to be arranged for inpatients to be brought across.

#### **PROSTHETISTS:**

There may be certain situations where a temporary prosthesis is deemed inappropriate, for example:

- Large / obese amputees where it is felt that plaster will not support their weight.  
At present, there is no known safe weight limit for use of plaster of paris



temporary prostheses, but they can be reinforced with synthetic casting material. Be aware of safe limits of other components, eg some knees and feet have limits of 100kg.

- Stumps with large areas of scarring or skin grafting, particularly over bony prominences or weight bearing surfaces.
- The transfemoral amputee who is too large for the supply of quad socket inlets in stock.
- The transtibial amputee with knee deformities, such as a previous patellectomy, which removes the ability to use suprapatellar cuffs for suspension.

These patients will require a referral to amputee clinic (doctors) & prosthetists for an interim prosthesis in these circumstances. To do this the patient needs to be booked into the clinic that happens fortnightly at GPNH for a prescription from the rehab consultant. Bookings for both clinics are through the day hospital front desk, PH: 4734 3898.

### **When can the client take their temporary prosthesis home?**

- Prosthesis fits properly – good alignment, pressure in pressure tolerant areas, not rubbing.
- They or carer knows how and what to monitor on stump ie when to add socks, pressure areas, when to stop using.
- The patient or carer is able to don prosthesis correctly.
- Patient is compliant with exercise program and will follow instructions – won't do anything to risk stump skin integrity or falls.

### **When is the patient ready for their definitive prosthesis?**

- Stump shape is stable, with consistent measures over >2 weeks, and no significant oedema on observation or palpation.
- The patient has demonstrated that they are physically capable of using or learning to use prosthesis.
- The patient has demonstrated that a prosthesis will be of benefit with an appropriate attitude to ongoing gait training and compliance with safe prosthetic use.
- Appropriate prosthetic components have been tried, or a decision on the most appropriate components can be made.

## **How to proceed with definitive prosthesis.**

- When patient is ready to get their definitive prosthesis they will require an appointment with the rehabilitation consultant at the amputee clinic. These clinics run on the first & third Thursday's of each month, at Governor Phillip campus.
- For appointments, phone 4734 3898.
- At this clinic, the consultant will write a prescription for the definitive limb to be supplied, with funding through the ALS.
- The amputee is entitled to get their limb made by any accredited prosthetist, but Southern Prosthetics & Orthotics attends these clinics and will cast for the definitive limb on the same day.
- There are many prosthetic components not covered under the ALS. Clients can choose to pay for more advanced or high-tech components themselves. However, given that the stump will continue to change size over the next few months, it is often inadvisable to spend large amounts of money on a limb which may have a limited lifespan due to the fit of the socket. It is also advisable to discourage purchase of advanced componentry if the client's functional abilities are such that they will gain no benefit from those components, eg carbon fibre feet for household ambulators.

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