Clinical Outcome Following Revision for Major Lower Limb Amputation

Rajesh Ramaswamy, MBBS, MSc, FRCS(Trauma&Ortho),
Karen Fairley, BScPT,
John J Murnaghan, MD, MSc, MA,FRCSC
The Problem
Introduction

- Limited literature to guide practice in revision amputation surgery
- Clinical practice followed Dr. Hunter at SCIL
Review of the Literature

- The value of revision surgery after initial amputation of an upper or lower limb.
  
  Wood MR, Hunter GA, Millstein SG. 
  
  *Prosthetics and Orthotics International, 1987;11: 17-20*

284 WSIB patients (184 Lower limb amputees)

Single or multiple revisions

All revisions carried out after 6 weeks of index operation

100% success in revisions for specific local pathology (e.g. late infections, bone spurs, soft tissue adjustments)

~35% success where pain alone indication for Sx
Review of the Literature

- Reamputation, mortality and healthcare costs among persons with dysvascular lower limb amputations.

Dillingham TR, Pezzin LE, Shore AD.
Arch Phys Med Rehab, 2005;86(3):480-6

- 12 month reamputation and mortality rates in 3565 dysvascular amputees
- 26% required reamputation within 12 months
- 33% Mortality rate
- 35% distal (Foot & Ankle) amputees required revision to proximal level
Review of the literature

- Reamputation occurrence in the diabetic population in South Wales, UK.
  Kanade et al
  *Int Wound J, 2007;4(4): 344-352*

  Chart review of 473 patients with and without diabetes referred for rehabilitation
  46% reamputation rates in diabetic population (205 patients)
  30% reamputation rate in non-diabetic, dysvascular patients (181 patients)

  In addition, 22% of diabetics had a contralateral amputation within 2 years versus 16% non-diabetic dysvascular patients
Study Objectives

To describe:

1. Indications and Complications in Major Lower Limb Revision Amputations

2. Clinical Outcomes
   a) Level of Surgery
   b) Effect on Ambulatory Status
   c) Relief of symptoms
   d) Mortality and Morbidity
Methods

- Retrospective Chart review after local REB approval
- Location- Sunnybrook Centre for Independent Living (SCIL), SHSC, Toronto, ON
- Source- Senior Author’s Personal Database (JJM)
- All major lower limb revision amputations 1998-2008
- Data Abstraction (DA) sheet to gather consistent data where available
Methods

- Ambulatory Status classified as Volpicelli et al 1987
  - Unlimited Community Ambulator (6)
  - Limited Community Ambulator (5)
  - Unlimited Household Ambulator (4)
  - Limited Household Ambulator (3)
  - Supervised Household Ambulator (2)
  - Wheelchair dependent (1)
  - Bedridden (0)
Inclusion Criteria

- All major lower limb reamputations at and above the ankle and below the hip
- WSIB and Non WSIB subjects
Exclusion Criteria:

- Dementia
- Any other Psychiatric Illness
Confidentiality

Study number assigned to each subject

Data stored in a password-protected computer

Hard copies of DA forms in a locked filing cabinet

Conflicts: No benefits received by authors to support this study
## Results: Demographics n=54

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Age at Amputation (yrs)</strong></td>
<td>57.1</td>
<td>61.1</td>
<td>58.2</td>
</tr>
<tr>
<td><strong>Minimum Age</strong></td>
<td>20</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td><strong>Maximum Age</strong></td>
<td>86</td>
<td>86</td>
<td>86</td>
</tr>
</tbody>
</table>
Results: Etiology Primary Amputation

- Peripheral Vascular Disease: 30
- Trauma: 15
- Infection: 4
- Other: 0
Results: Level of Primary Amputation
n=54
Results: Clinical Complaints/Findings Leading to Revision Surgery

- Skin Breakdown
- Drainage
- Pain
- Poor Prosthetic Fit
- Other
Surgical Indication for Revision Surgery

$n=54$

- Wound Necrosis/Infection
- Bursitis
- Heterotopic Ossification
- Poor Soft Tissue
- Other
Results: Relief of Symptoms

- Complete: 81%
- Partial: 19%
- No Relief: 0%
Surgical Complications
(Overall)

- Wound necrosis: 10
- Infection: 3
- Hematoma: 2
- Other: 1
General Medical Complications
(Overall)

- MI: 1
- STROKE: 2
- DEATH: 7
- OTHER: 8
Results: Ambulatory Status
(All levels)
Results by Level Initial Amputation

- Ankle Disarticulation
- Transtibial
- Knee Disarticulation
- Transfemoral
Results by Level Initial Amputation

- **Ankle Disarticulation: n=4**
  - All 4 revised to transtibial level.
  - 2/4 remained unlimited community ambulators and 1 became limited community ambulator; one became bedridden due to medical complications and died.
  - ¾ complete relief of pre-op symptoms, ¼ partial

- **Knee Disarticulation: n=2**
  - Revised to Transfemoral level with complete relief
  - 1/2 became limited community ambulator. Final ambulatory status of other is unclear from chart
Results: Levels of Revision

- Transfemoral: 5 (Proximal), 7 (Local)
- Knee Disarticulation: 2 (Proximal)
- Transstibial: 10 (Proximal), 5 (Local)
- Ankle Disarticulation: 4 (Proximal)
### Results: Time to Revision

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfemoral (n=12)</td>
<td>3.2 yrs</td>
<td>(.1-18.1 yrs)</td>
</tr>
<tr>
<td>Knee Disarticulation (n=2)</td>
<td>6.0 yrs</td>
<td>(1-11.0 yrs)</td>
</tr>
<tr>
<td>Transtibial (n=36)</td>
<td>5.0 yrs</td>
<td>(.1-38.2 yrs)</td>
</tr>
<tr>
<td>Ankle Disarticulation (n=4)</td>
<td>13.3 yrs</td>
<td>(1.4-51.3 yrs)</td>
</tr>
</tbody>
</table>
Results: Indications for revision

- Transfemoral n=12

- Wound necrosis/Infn: 9
- Bursitis: 1
- HO: 2
- Poor soft tissue: 2
Wound Necrosis/Infection
Late Soft Tissue Problem
Results: Ambulatory Status (By Level)

- Transfemoral

![Chart showing ambulatory status by level for Transfemoral procedure with bars for PRE and POST data.](chart.png)
Results: Indications for revision

- Transtibial n=36
Extensive Soft Tissue Injury from Trauma
Late Skin Breakdown due to Poor ST
Transtibial with deep cleft and minimal padding
Final Appearance
Results: Ambulatory status (By Level)

- Transtibial
Summation

- **All Transfemoral-Transfemoral (7/12)**
  Dropped 1 or more level

- **All Transfemoral–Hip Disarticulation (5/12)**
  All became wheelchair users or bedridden
Summation: Ambulatory Status

- **All Transtibial Local Revisions (21/36)**
  3 improved (14%), 13 Unchanged (62%), 5 lost minimum of 1 grade ambulatory status (24%)

- **Transtibial-Transfemoral (10/36)**
  9 lost at least 1 grade ambulatory status (90%)

- **Transtibial-Knee Disarticulation (5/36)**
  2 Improved (40%), 3 lost minimum of 1 grade ambulatory status (60%)
Heterotopic Ossification (HO)

- 6/54 (11%) had HO requiring revisions
- 4 Males / 2 females
- 4 Transtibial / 2 Transfemoral
- Etiology- Trauma(3)
- PVD(2),
- Unclear (1)
- 4 Local Revisions; 2 Proximal (Transtibial to Transfemoral)
Re revisions

- 5/54 (9%) underwent re revisions
- 1 Local and 4 Proximal (2 Transtibial to Transfemoral, 1 Transtibial to Knee Disarticulation, 1 Transfemoral to Hip Disarticulation)
- Complications: Wound necrosis 2, 1 infection, Poor soft tissue cover 1, HO 1, Occlusion of vascular graft 1.
Discussion

- Indications: The indications are those recommended by Wood et al 1987
- Perioperative morbidity (~50%) and mortality (13%) similar to those reported
- 81% had complete relief of symptoms and remaining 19% had partial relief of symptoms
- Ambulatory status: majority decreased at least 1 level of function when revised to a more proximal level
- Mortality 13%
Discussion

- Weaknesses:
  - Single surgeon
  - Selected population
  - Retrospective study
Discussion

- **Strengths:**
  - Included all etiologies including dysvascular and diabetic patients
  - Moderate sized sample for transtibial level
  - Follow up
Conclusions

- Revision of Amputation can provide symptomatic relief when surgical goal is clear
- The perioperative morbidity (~50%) and mortality rates (13%) are significant
- The general effect is a decline in ambulatory status except for transtibial amputees suitable for local revisions
Research is a Team Sport
Acknowledgements

- Authors wish to recognize assistance provided by Ms. Tracey Cuddington, Administrative Supervisor, SCIL for assistance with data analysis.