



Rehabilitation of the Above Knee Amputee

Dr Simon Chan FAFRM (RACP)

Consultant Physician in Rehabilitation Medicine

To improve is to change; to be perfect is to change often.

Winston Churchill



Outline

- Progress of “Conventional” Transfemoral Rehabilitation
- Limitations of Conventional Treatment
- Where to from here?

Epidemiology of LL Amputations

- Predominantly Vascular aetiology 70% then trauma 12%
- Major Amputation rate 5.1/100,000 population
- Mortality rate 16.8%
 - 21.4% TFA
 - 11.6% TTA
- 39.4% had Diabetes Mellitus

Moxey PW et al 2010, UK data

Capua Leg 300BC



Progress in rehabilitation

- 1529 Use of ligatures reintroduced by Ambroise Pare (French military surgeon)
 - Led to increased use of amputation with resultant improved survival
- 1674 Introduction of tourniquet (Morel)
- 1679 Flap Amputations (Younge)
- 1800s numerous advances
 - Aseptic technique 1867 (Lister)
 - Use of anaesthesia (chloroform/ether)
- Mid-1900s refinement of myodesis technique

Progress in rehabilitation

- Development of co-ordinated program in US
 - 1947 - 1955: Advisory Committee on Artificial Limbs....
 - 1976: Artificial Limb Program
 - Collaboration of physicians with surgeons with engineers
- Transfemoral “Quadilateral” socket University of Berkeley circa 1950
- Ischial Containment Sockets developed 1980s
- Icelandic, Scandinavian, New York (ISNY) socket 1987

Progress in rehabilitation

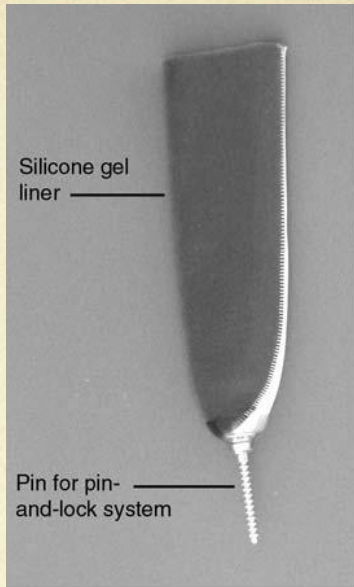
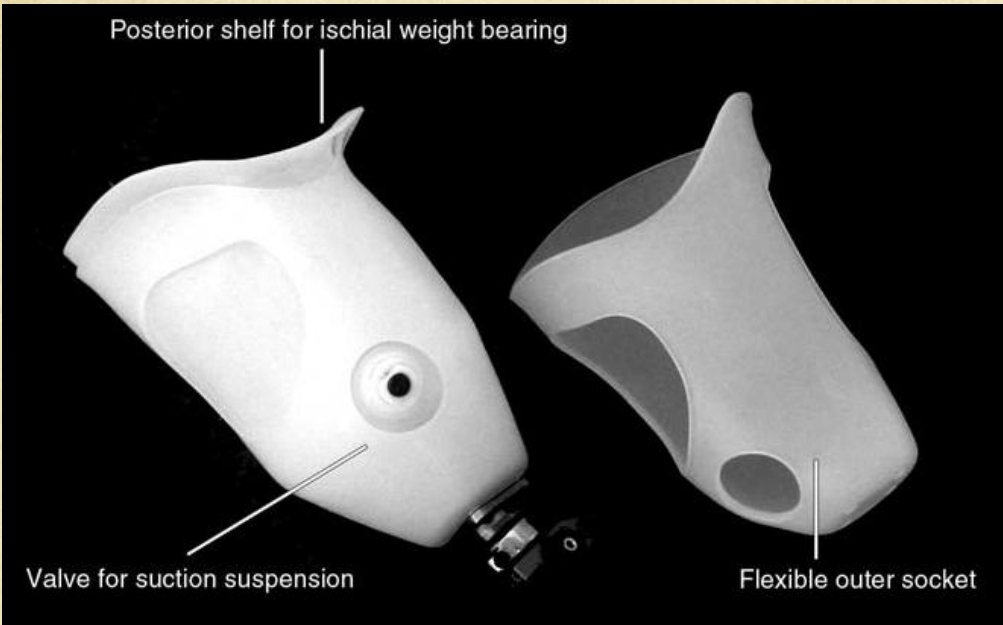
- Improvement in materials
 - WWII: wood & leather
 - Introduction of thermosetting resins (sockets/SACH foot)
 - Polypropylene introduced 1975
- Improvement in componentry
 - Fixed vs variable cadence (hydraulic) knees
 - Microprocessor knees in the 1990s
 - Non-dynamic & dynamic response feet

Quadilateral Socket

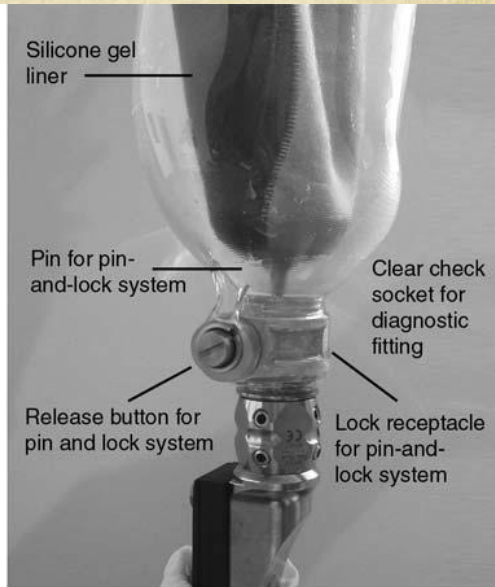


Ischial Containment Socket

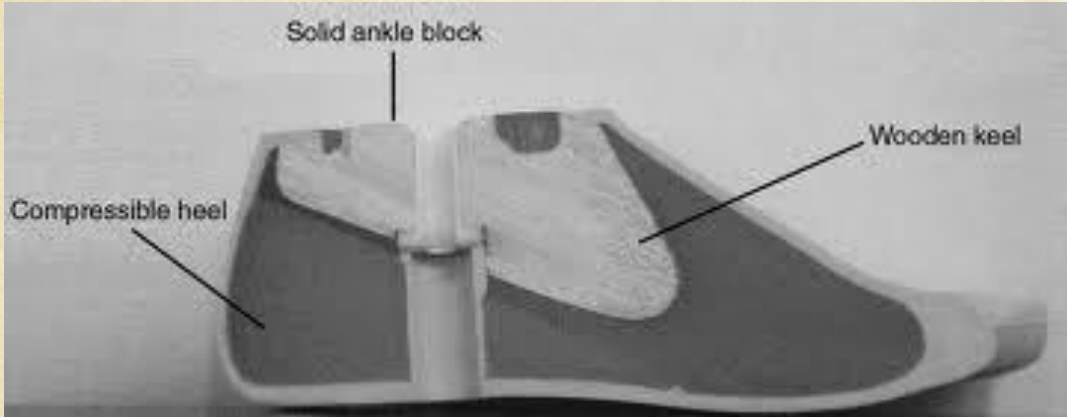




A



B



The progress to date



Sourced from internet/Ottobock

Implications of Transfemoral Amputation

- Limb shortening
- Weight Transmission
- Muscle Loss (quadriceps, ankle dorsiflexors)
- Muscle imbalance (hip flexors/abductors)
- Loss of distal (knee/ankle/foot) joints
- Loss of sensation
- Altered base of support
- Altered circulation
- Impaired heat exchange
- Increased energy expenditure (68 to 100% increase)

Design Principles of Transfemoral Socket Design

- Maintain normal femoral adduction & narrow based gait
- Enclose ischial tuberosity & ramus within socket to create “skeletal lock”
- Distribute forces along femoral shaft
- Total contact
- Suction suspension where possible

Friel 2005 J Am Acad Orthop Surg

Persisting Problems with TFA patients

- Comfortable socket fit
- Ability to compensate for socket size fluctuations
- Weight of prosthetic componentry
- Alignment of prostheses
- Adjusting to nuances of typical human gait

Collins et al 2006, Crit Rev in Biomed Engineering

Typical issues seen in ILP clinic

- Socket fit & fluctuation
- Pain
- Skin breakdown
- Poor gait pattern
- Limited/non-prosthetic use as a result
- Impact on daily function, activity & participation

Case Study: Ms MC

- 42 yo Registered Nurse
- 1996 Fall beneath subway train in UK
- Left Transfemoral Amputation
- Unable to tolerate conventional prosthetic fitting
- Pain, short stump affecting socket & suspension
- Mobilised with bilateral crutches
- ILP procedure with stump lengthening 8cm early 2012



It is always wise to look ahead, but difficult to look further than you can see.

My most brilliant achievement was my ability to be able to persuade my wife to marry me.

Winston Churchill

Thank you.