Paper I: Upper Limb prosthetics and orthotics and Spinal orthotics

Chapter 6: Upper limb Socket Designs

Intake 2016

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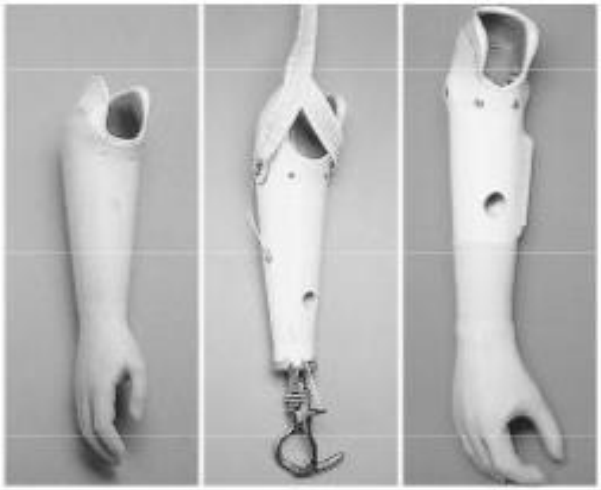
Introduction

- If you break a trans-radial prosthesis into parts, can you name each part of it?
  - Socket designs
  - Suspension system
  - Terminal devices
  - Connectors



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Types of the Prosthesis

❖Passive/Cosmetic

Provide no function of the hand grip

❖Function

Provide some function hand grip

Body Power

Use body movements to operate the hand

External Powered

Use either electrical impulse from the muscle (Myoelectric control) or battery (switch control)

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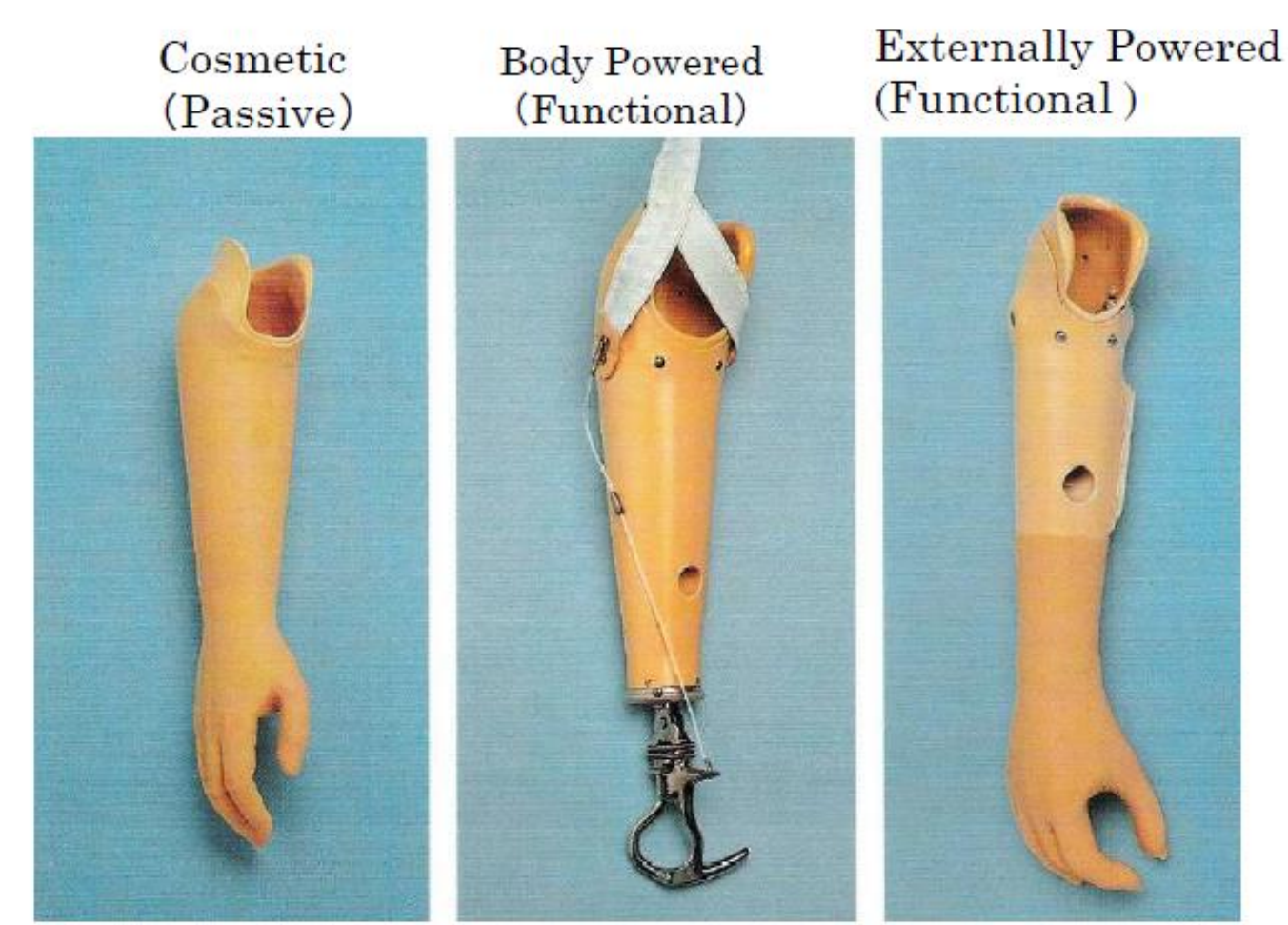
Types of the Prosthesis



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Socket Designs

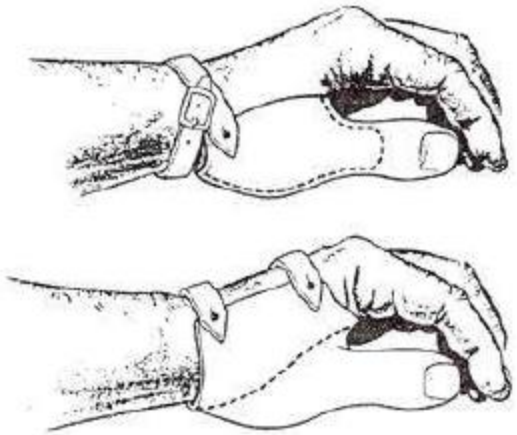
- Sockets should be designed to:
  - Be comfortable
  - Provide good force transmission
  - Control rotation
  - Be stable on the residual limb
  - Easy donning and doffing

Prosthetic Option for partial hand

- Passive partial hand Prostheses
  - Passive partial hand option include multiple fingers, thumb and partial hand
    - To provide appearance restoration of the hand

Finger Prostheses

Thumb Prostheses



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Prosthetic Option for partial hand

- Functional partial hand prosthetic solution
  - Provide basic grasping ability to restore loss of fingers

Body Powered finger Prosthesis

Electrically finger Prosthesis

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Prosthetic Option

- Variety of prosthetic option for specific task are created to meet intended specific activity

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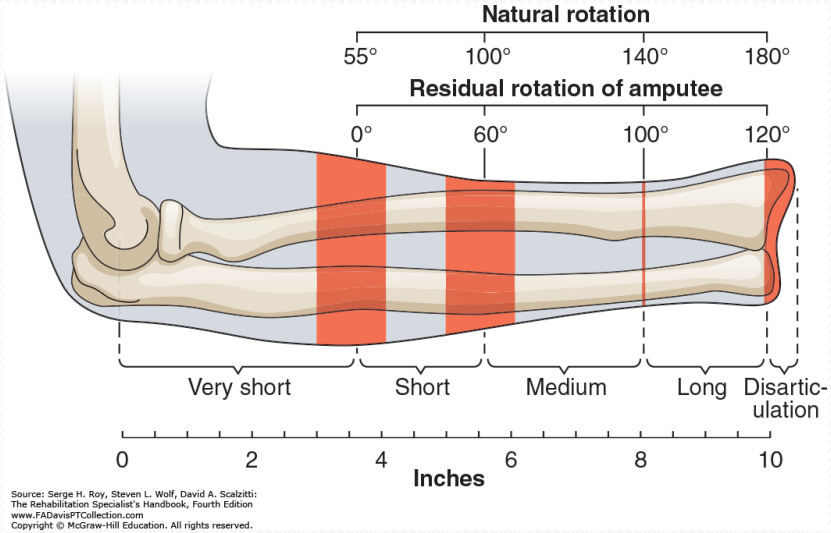
Socket designs for below elbow

A. Plug fit (or standard)
B. North Western supra-condylar (NWSC)
C. Muenster
D. Stratchlyde Supra Olecranon Socket



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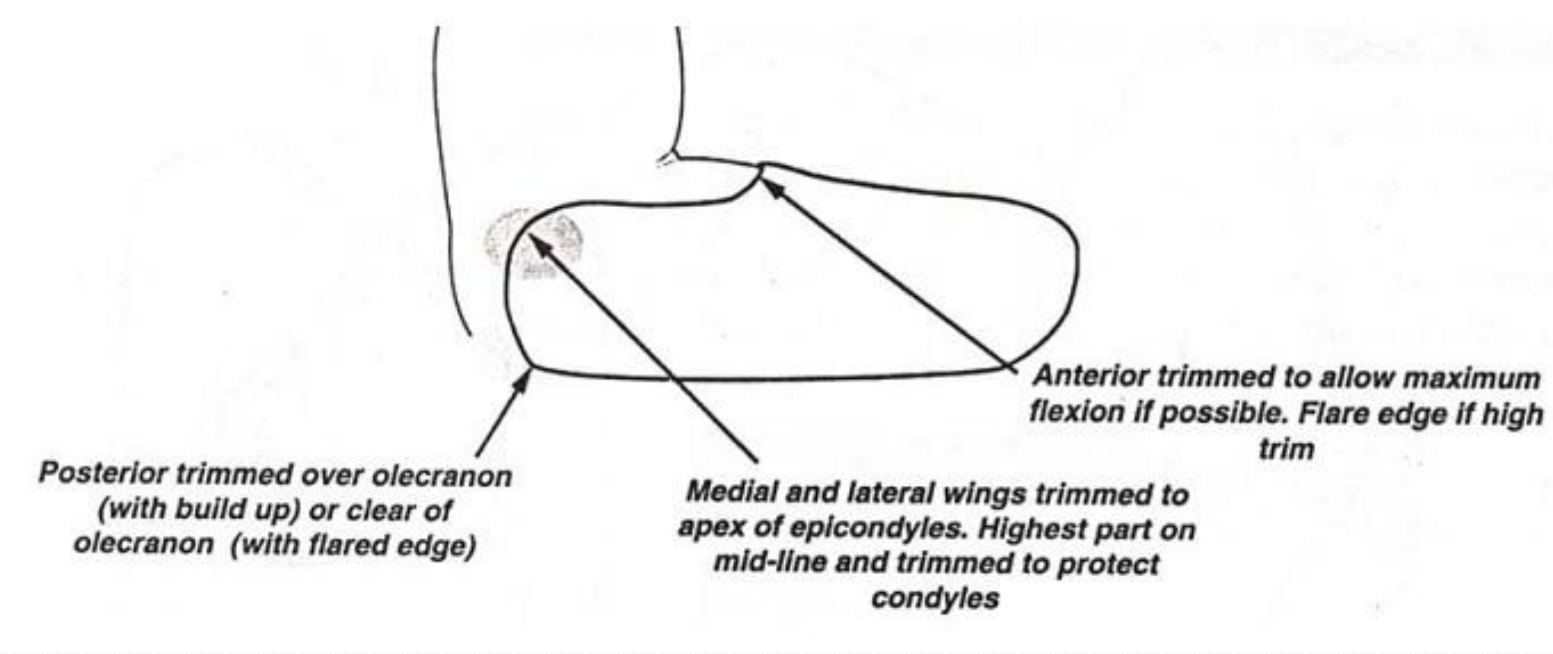
A. Plug fit

- Forces are transferred between the stump and the prosthesis through circumferential pressure
- Anterior & posterior aspects of the socket are flatten to provide rotational control
- It can be used for a long TR with a good soft tissue coverage
- Allows a full range of motion of elbow joint and ulnar-radial joint
- Requires a harness to suspend a socket

Trim-lines



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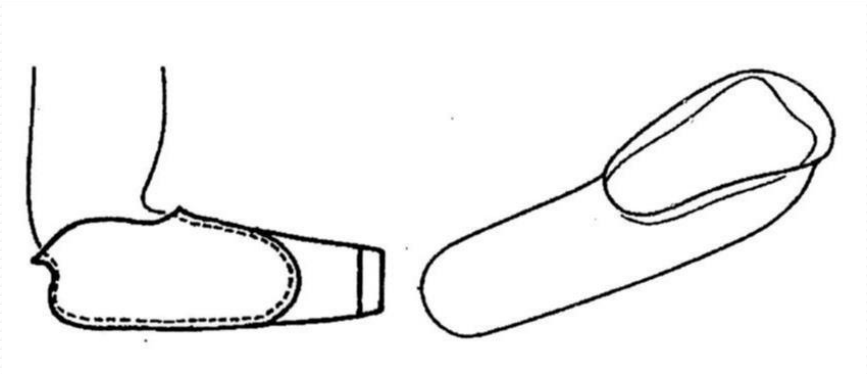
B. North Western Supracondylar NWSC

- Self-suspended
- Not allow pronation and supination
- Additional medial & lateral flares help
  - Keep the prosthesis stable
  - Transferring forces

- It is often used for a patient who have **a long-medium-length** stumps



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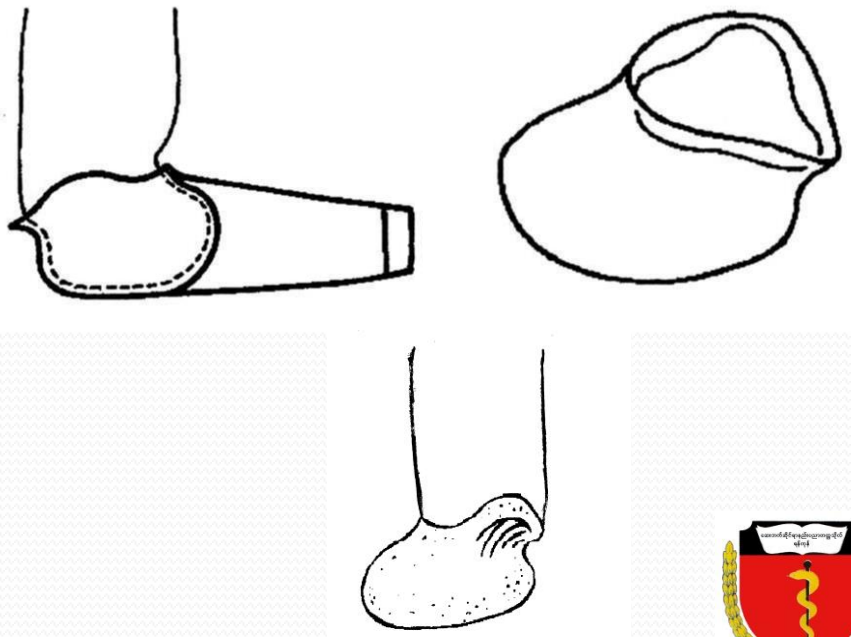
C. Muenster

- Self-suspended
  - Medial trim-lines cover medial, lateral condyles
  - Posterior trim-line encloses an elecranon
  - Anterior trim-line is kept proximal to the level of the cubital crease
- Provides very good stability for **Short and very short stump**
- No pronation or supination is allowed
- Prevent full extension and flexion



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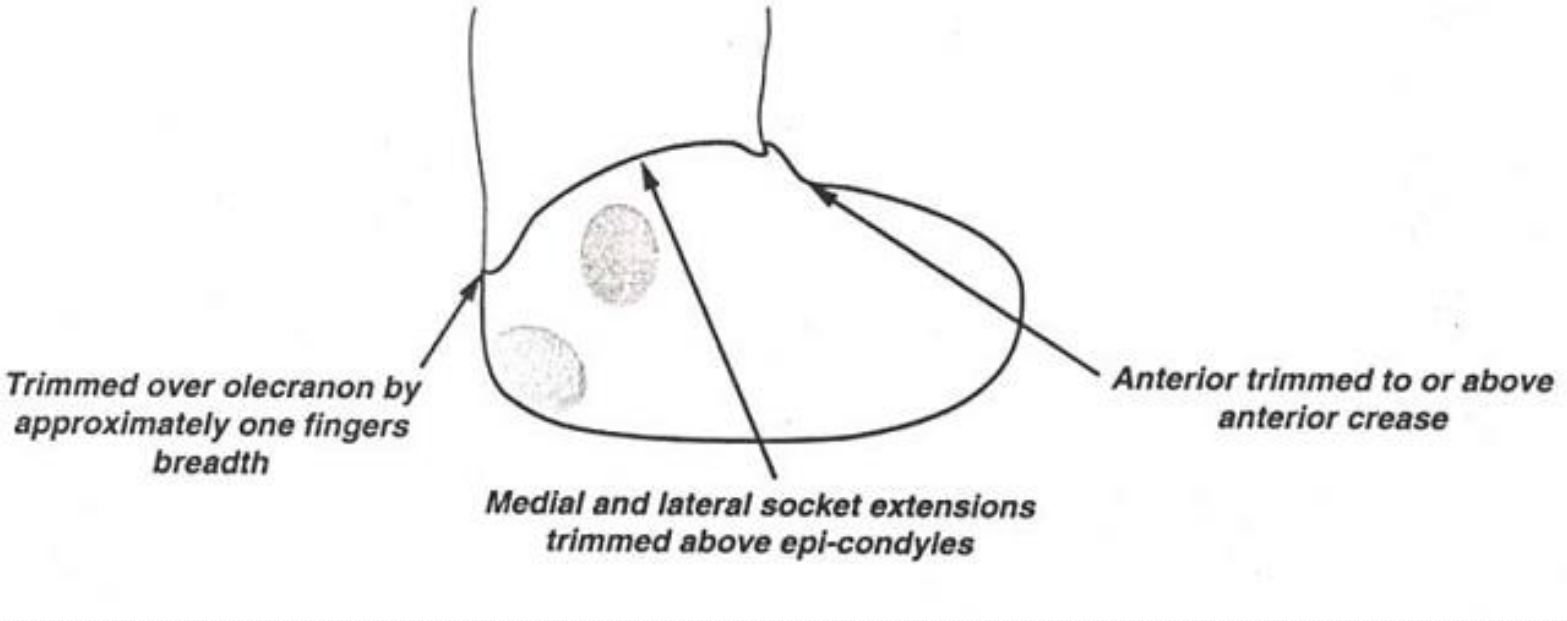
Trim-lines



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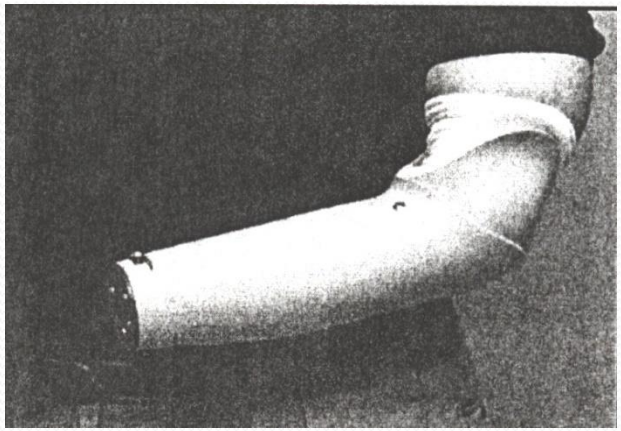
D. Strathclyde Supra Olecranon Socket (SSOS)

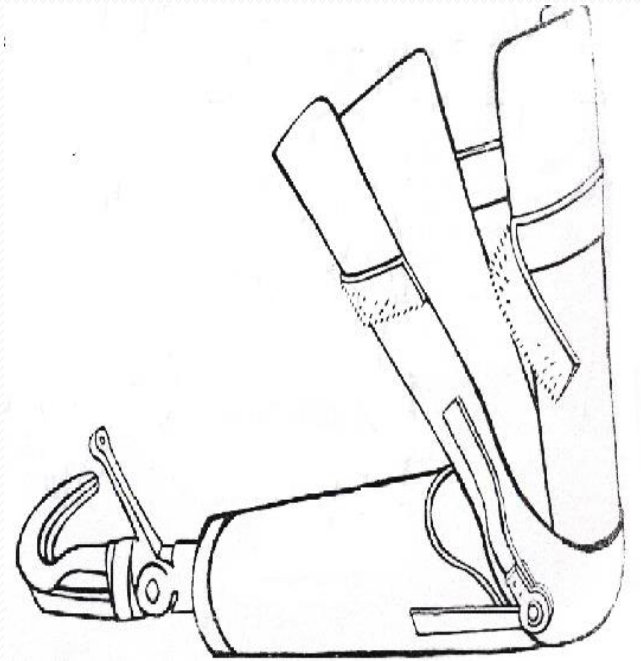
- Self-suspended
  - Over the olecranon
- Medial and lateral wings help to maintain the position of the socket on the stump
- Limit the extension
- Restrict forearm motion

- Not clear about the indication but practically, it is prescribed for a **medium length stump**



Elbow disarticulation prosthesis

- Socket need to be split or build up liner for donning and doffing
- Rotational control can be obtained by flattening Ant/Post distal part of socket or extend proximally



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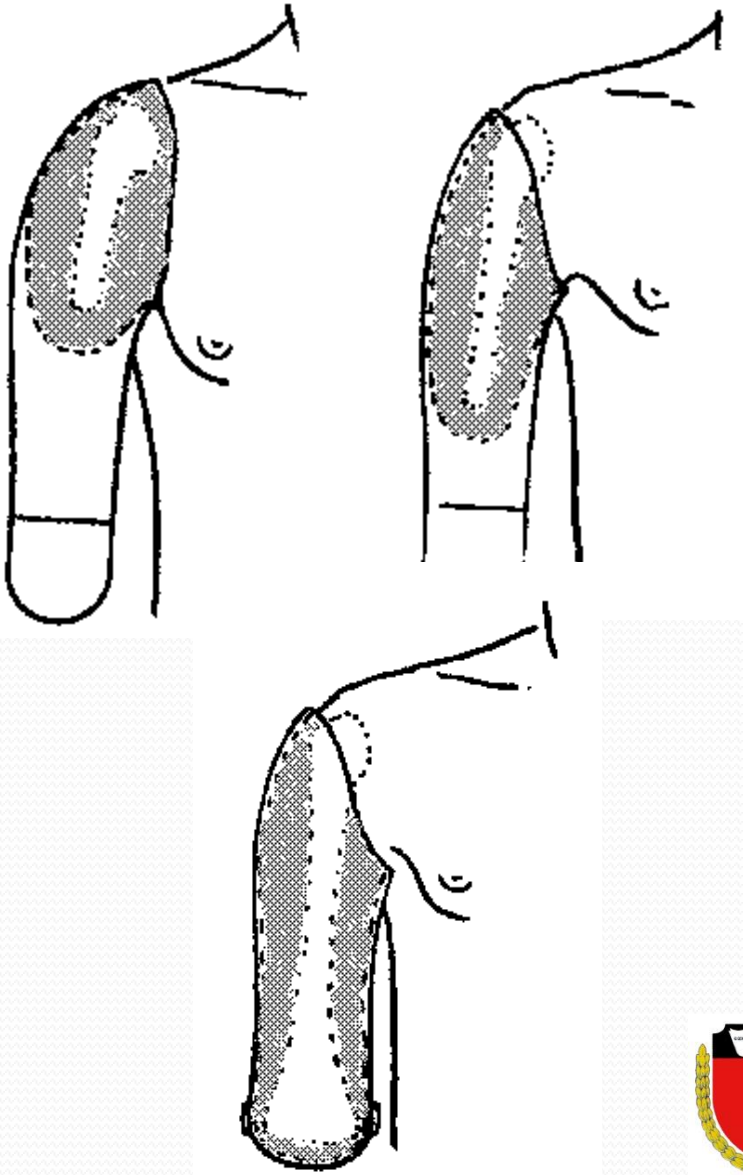
Socket designs for above elbow

- There are 2 basic socket designs:
  A. Over shoulder design
  B. Short trim-line or below acromion design

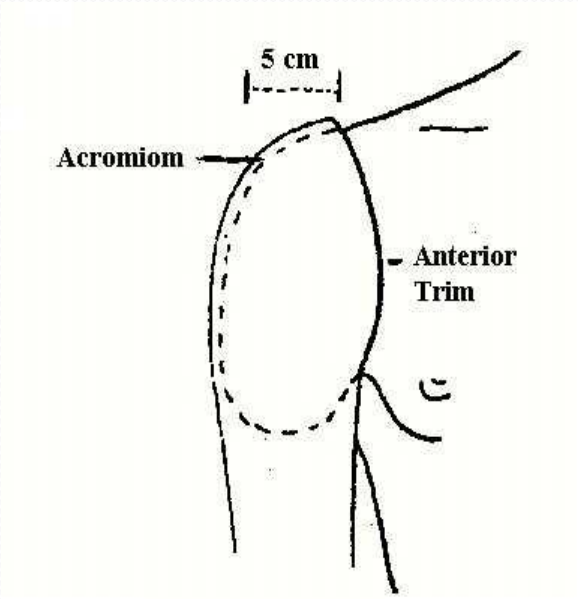
Trans humeral socket design

- Must consider;
  - Rotational stability
  - Suspension
- Socket design and trimlines will depend on stump length.



A. Over the shoulder design

- Proximal trimline over shoulder
- Medial trimline is just below the medial axilla
- Reduces harness forces



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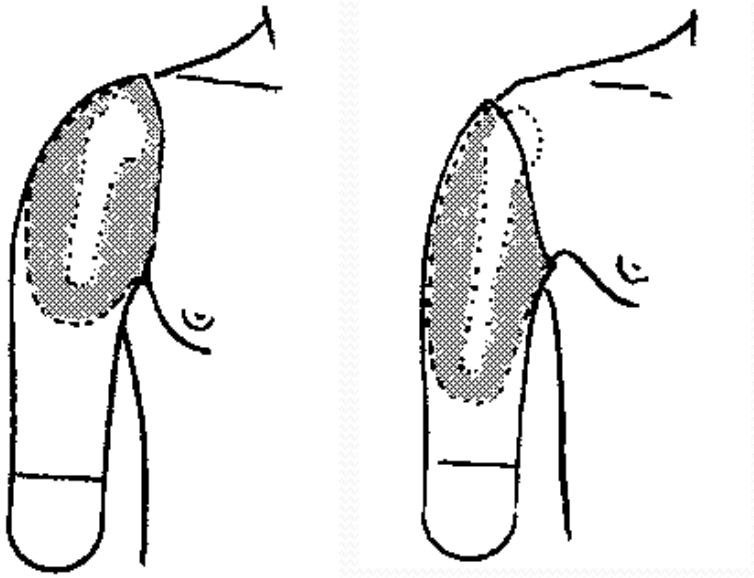
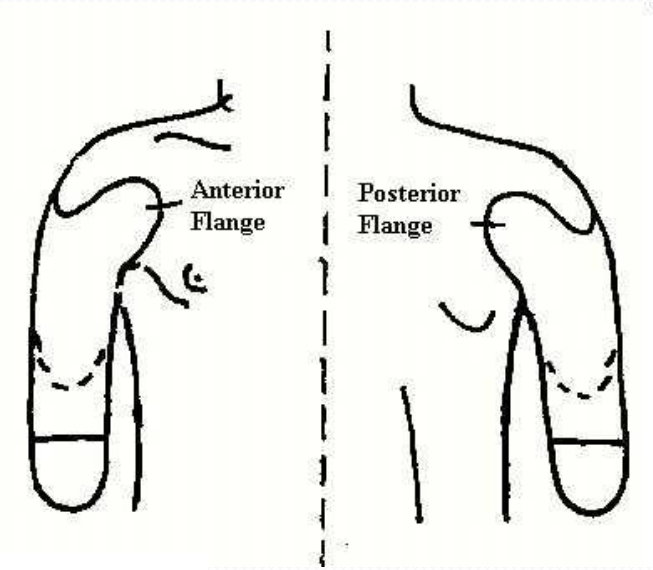
A. Over shoulder design

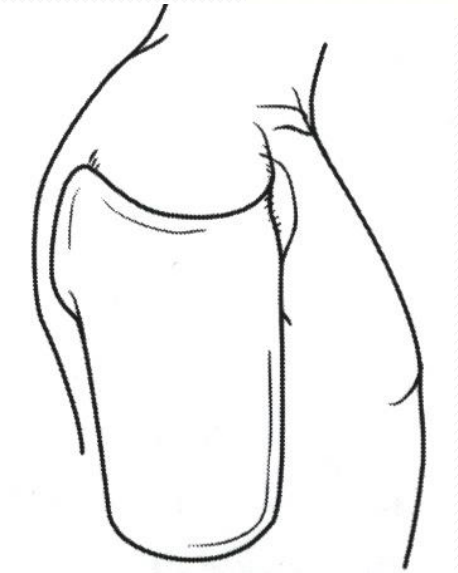
- Trim-lines extend over the shoulder to allow suspension forces to be taken through the socket which reduces the harness forces
- Abduction of shoulder joint is limited

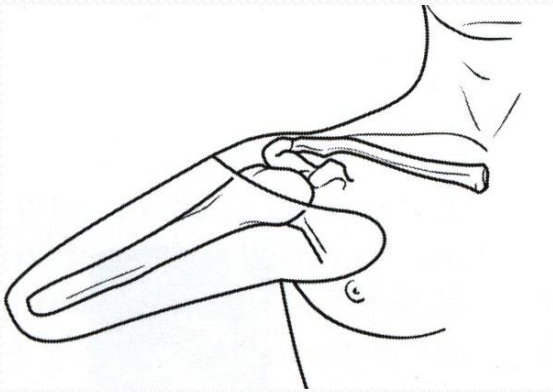


B. Below acromion design

- Trim-lines are below the acromion level
- Require harness straps for suspension
- Abduction of shoulder joint is not limited
- Self-suspension can be produced
- Silicon suspension system is also available







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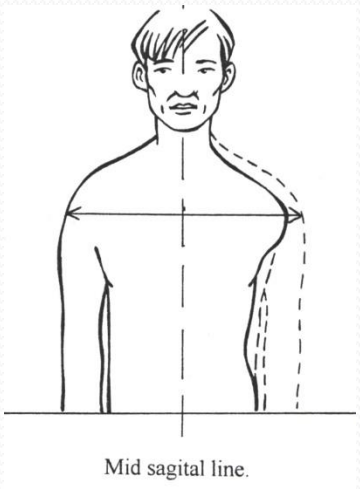
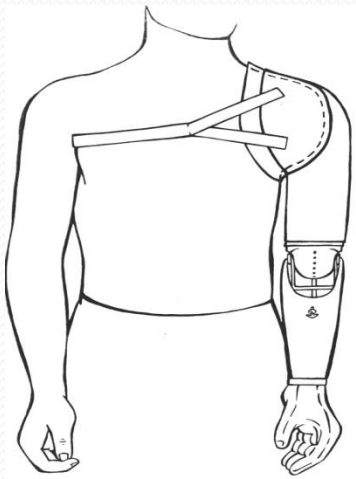
Shoulder disarticulation prosthesis





- No special design
- Consider symmetrical of shoulder
- Consider about trimline, straps, harness and material to improve functions

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Suspension – self suspending sockets

Advantages	Disadvantages	Indication	Contra-indication
• Easy to don & doff	• Restriction to RoM of the elbow joint and forearm	• Cosmesis is important	• Early operative stage
• Less restrictive to the contralateral side	• May cause discomfort over suspension areas when doing heavy works	• Passive use & patient's preference	• Fitting with children
• Minimal strap control		Short stump	• Scar tissue or a skin graft over the area of suspension
		Scarring on ipsilateral axilla	

Suspension - harness

- The use of a harness suspension for a TR amputation may be required if:
  - Short stump
  - Oedema with pain
  - Bilateral
  - Keeping a prosthesis in place is the major importance
  - Using it for a long time and don’t want to change
  - Young children to prevent them removing it

Thank you

for your attention

& Any questions??

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